MEMORANDUM

TO: Chas Ariss, P.E., Wastewater Program Manager
Erick Neher, Regional Administrator
Greg Eager, P.E., Regional Engineering Manager

FROM: Tom Rackow, P.E., Idaho Falls Regional Office

DATE: September 11, 2015

SUBJECT: I-010-06 Idahoan Foods – Idaho Falls Facility, Staff Analysis supporting reuse permit issuance.

Executive Summary

The Idahoan Foods – Idaho Falls Facility is a potato processing facility that produces dehydrated potato products. The industrial wastewater is pre-treated and the recycled water is land applied year-round to an adjacent 202.3-acre reuse site. Irrigation upgrades to the reuse site in 2005 and 2006 included conversion from flood irrigation to center pivots and big-guns, construction of a new pump station including SCADA control of all systems, and construction of a 5 million gallon storage lagoon intended to be used only in the winter to retain recycled water during the colder hours (nighttime) and pump to irrigation equipment during warmer hours (daytime). To prevent nuisance odor conditions, the lagoon was designed and intended to remain empty during summer months except for emergencies. The facility currently generates approximately 125 million gallons of recycled water per year and since 2003 has been permitted to apply nitrogen at 600 lb/ac-year with a Non-Growing hydraulic loading limit of 12.8 inches/acre and a Growing Season limit substantially equal to Irrigation Water Requirements. The facility has water rights and access to supplemental irrigation water from a neighboring canal to provide the makeup water needed to meet irrigation demand. Ground water is approximately 165 feet deep and significant ground water impacts have not been detected.

There have been no major changes to facility operations since the last permit, LA-000010-05, was issued in November 2009. Other than the irrigation upgrades in 2005 and 2006, facility operations and permitted nitrogen, COD, and hydraulic loading limits have remained substantially unchanged since the previous permit LA-000010-04 was issued in August 2003.

Idahoan Foods is applying for a routine permit renewal, and is requesting that the new permit I-010-06 maintain the same limits and conditions as the current permit LA-000010-05 and the previous permit LA-000010-04. DEQ review of the 2009 – 2015 annual reports indicates substantial compliance with permit requirements. Similarly, DEQ performed a comprehensive inspection of the reuse facility in August 2013 that found the facility to be generally well operated and in compliance with permit limits and conditions.

It is recommended that the new reuse permit I-010-06 be issued to Idahoan Foods, LLC for continued operation of their Idaho Falls reuse facility at currently-permitted rates.

1 Introduction

The purpose of this memorandum is to satisfy the requirements of IDAPA 58.01.17.400 for issuing Water Reuse permits. It briefly states the principal facts and significant questions considered in preparing the draft permit and provides a summary of the basis for the draft permit conditions.

A brief summary of timelines is as follows:

- The first reuse permit (LA-000010) was issued to this facility in March 1990 allowing the application of 700,000 gallons of wastewater per day on 136 acres.
- A modified permit (LA-000099) was issued in August 1990 expanding the acreage to 197 acres.
- The third permit (LA-000010-03) was issued in November 1996 allowing application of 200 million gallons annually on a total of 310 acres of land.
- The fourth permit (LA-000010-04) was issued in August 2003. This permit established the limits and conditions that are still in effect at this reuse facility today. Three fields (H, I, and J) that had never been used for reuse were removed from the permit, reducing permitted acreage to the current 202.3 acres.
- The fifth and current permit (LA-000010-05) was issued in November 2009 as a routine renewal of the previous permit LA-000010-04. The permit has an expiration date of November 19, 2014.
- Idahoan Foods submitted permit renewal application materials to DEQ on April 21, 2014 (its initial permit renewal request) and November 18, 2014 (completed permit application forms).
- DEQ issued a permit application completeness determination letter on November 18, 2014, and a preliminary decision to renew letter on November 24, 2014. Idahoan Foods has continued to operate under the limits and conditions of LA-000010-05 during this permit renewal process.

2 Site Location and Ownership

The Idahoan Foods – Idaho Falls facility is located on West River Road approximately 1.5 miles north of the Idaho Falls Airport in Bonneville County. Vicinity and Management Unit-specific maps of the facility are shown in Figures 1 and 2.

The reuse fields are located adjacent to the processing plant on the west side of West River Road. The processing facility and all of the reuse facility and fields are owned by Idahoan Foods, LLC.

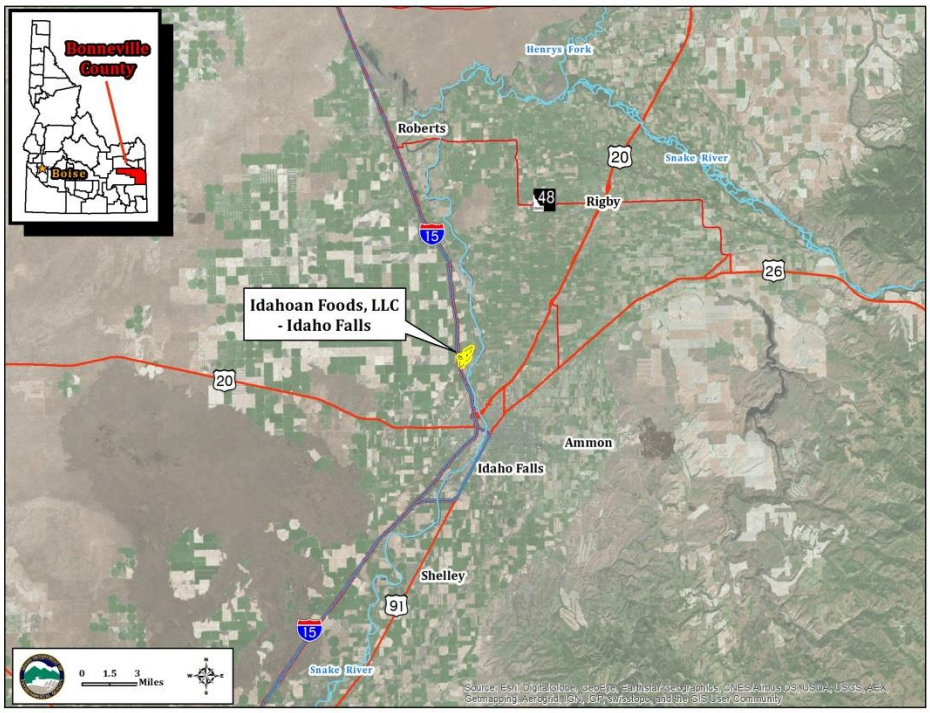


Figure 1. Idahoan Foods – Idaho Falls facility.

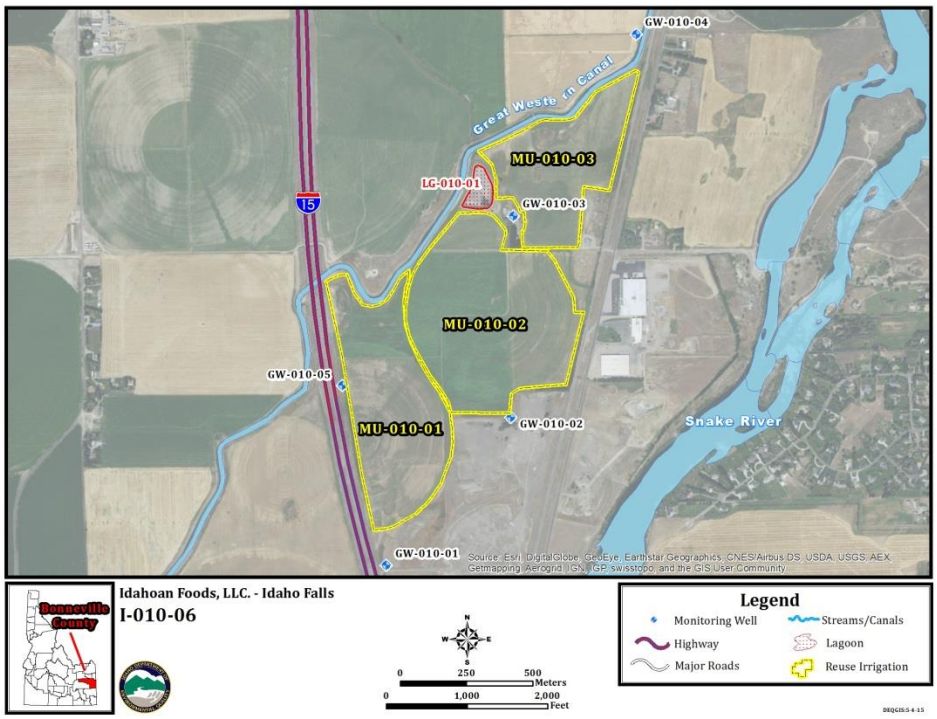


Figure 2. Reuse Management Units (MU's)
and ground water monitoring wells associated with the reuse system at Idahoan Foods – Idaho Falls.

3 Process Description

Idahoan Foods, LLC produces various dehydrated potato products. The industrial wastewater is pre-treated using a system of screening, settling and centrifugation, and then land applied to a 202.3-acre reuse site split into three separate Management Units (MU's). Solids removed from the system are either disposed in old, dry lagoons behind the facility or sold as cattle feed. The Slow Rate land application system at the Idaho Falls facility has been in operation since April 1982, prior to the reuse permitting program which commenced in 1988.

The facility does not discharge to the Snake River and does not have an EPA NPDES permit. All industrial recycled water is land applied to the reuse site. All municipal wastewater is treated via an onsite subsurface disposal system (i.e. a septic system) permitted by the Eastern Idaho Public Health District.

Idahoan operates their Idaho Falls facility year-round with a brief shutdown for annual maintenance in the late summer or fall. The industrial wastewater is pre-treated and the recycled water is land applied year-round to an adjacent 202.3-acre reuse site. Irrigation upgrades to the reuse site in 2005 and 2006 included conversion from flood irrigation to center pivots and big-guns, construction of a new pump station including SCADA control of all systems, and construction of a 5 million gallon storage lagoon intended to be used only in the winter to retain recycled water during the colder hours (nighttime) and pump to irrigation equipment during warmer hours (daytime). To prevent nuisance odor conditions, the lagoon was designed and intended to remain empty during summer months except for emergencies.

The facility currently generates approximately 125 million gallons of recycled water per year and is currently permitted to apply nitrogen at 600 lb/ac-year with a Non-Growing hydraulic loading limit of 12.8 inches/acre and a Growing Season limit substantially equal to Irrigation Water Requirements. The facility has water rights and access to supplemental irrigation water from the Great Western Canal to provide the makeup water needed to meet irrigation demand.

There have been no major changes to facility operations since the last permit, LA-000010-05, was issued in November 2009. Other than the irrigation upgrades in 2005 and 2006, facility operations and permitted nitrogen, COD, and hydraulic loading limits have remained substantially unchanged since the previous permit LA-000010-04 was issued in August 2003.

Prior to the start of the land application system in 1982, the facility apparently discharged to the Snake River through a set of settling lagoons located behind the facility. The old lagoons are disconnected from the reuse system and are dry. Through its approved Waste Solids Plan, Idahoan is filling in the old dry lagoons with its waste solids such as tare dirt, rocks, cull potatoes and mud removed from its silt settling system. Idahoan also transports cull potatoes and other 'edible' waste solids offsite for cattle feed. Tare dirt and settled mud is sometimes used to fill in low spots in the reuse fields.

The reuse fields are summarized below:

- Management Unit #1 (Field #1, or MU-01) is a 56.6-acre MU that consists of a half-circle pivot and associated corners that are irrigated with 'big-gun'-type sprinklers.
- Management Unit #2 (Field #2, MU-02) is a 97.5-acre field that consists of about a 7/8ths pivot and associated corners irrigated with big-gun-type sprinklers. The pivot wraps

around both sides of the farm manager's home and acreage so a small pie shaped portion of the pivot cannot be used.

- Management Unit #3 (Field #3, MU-03) is 48.2-acres and is irrigated with big-gun-type sprinklers year round.

4 Site Characteristics

4.1 Site Management History

The reuse system has been in operation at the facility since 1982. Prior to that, it appears the facility must have discharged to the Snake River through a series of settling ponds behind the facility. During its lifetime, records show the facility has been known as Mikami Brothers Produce Company, Idaho Fresh Pak Plant No. 2, RDO, North American Foods, and now Idahoan Foods, LLC. RDO, North American Foods, and Idahoan Foods LLC has been the same company and personnel, just with different names.

Recycled water is land applied year round. In previous years the facility grew rotations of alfalfa, grass, corn and barley but now grows primarily a grass-alfalfa mix. Supplemental irrigation water is used to meet irrigation water requirements. Supplemental fertilizer is only applied when soil analysis notes a nutrient deficiency.

As stated earlier, the current nutrient, organic and hydraulic loading limits have been in place since 2003 through two permit cycles, LA-000010-04 and LA-000010-05.

4.2 Climatic Characteristics

The climatic characteristics at the Idaho Falls facility are typical of the high-desert characteristics of the surrounding area. Climate data from the Western Regional Climate Center for the nearby National Weather Service Station at the Idaho Falls Airport is summarized as follows:

- Average annual precipitation of 10.03 inches.
- Minimum monthly precipitation of 0.54 inches in July.
- Maximum monthly precipitation of 1.38 inches in May.
- Average max. temperature of 85.8 degrees F in July.
- Average min. temperature of 10.0 degrees. F in January.
- Average snowfall of 35.3 inches, with an average maximum depth of 5 inches in January.
- Winds generally out of the southwest.

The precipitation deficit (net irrigation water requirement, Pdef) for crops grown in the area of Idahoan's Idaho Falls facility are as follows, using an irrigation efficiency (Ei) of 80% for the center pivots and 55% for the big-guns:

Crop	Pdef @ Ei = 80%	Pdef @ Ei = 55%
• Alfalfa, frequent cuttings:	35.6 inches	51.8 inches
• Grass Hay	36.4 inches	52.9 inches
• Winter Wheat	29.9 inches	43.5 inches
• Silage corn:	23.5 inches	34.1 inches

4.3 Soils

The land treatment site is located on quaternary alluvium composed of silt, sand, and gravel that overlies basalt. Soils in the land application area are classified as Bannock Loam, Bock Loam, Harston Fine Sandy Loam, and Pancheri Silt Loam. Soils were formed from mixed alluvium and generally are listed as very deep and well drained with slopes less than two percent. Permeability for the soils ranges from 0.6 to over 20.0 inches per hour. Available Water Capacity (AWC) is variable and ranges from 0.03 to 0.21 inches per inch in the upper 60-inch profile. Staff calculated a composite AWC of approximately 8.8 inches for the original 202.3 acre site. Soil pit tests conducted by the facility indicate that the soils on site are generally as mapped by the 1981 NRCS Soil Survey for Bonneville County (Idaho Fresh Pak, Inc., Permit Application Report, 2001).

4.4 Surface Water

The Snake River is located approximately ¼ mile east of the reuse site, behind the processing facility. The reuse fields are separated from the river by the railroad tracks, West River road, and Idahoan's Processing facility. There is no potential for runoff from the reuse site to reach the river. The Snake River in this stretch is also believed to be perched above, or not connected to, the regional aquifer in this area. The vadose zone is believed to be dry between the river and the ground water table. Ground water is approximately 165-feet deep at this location based on review of well logs for the area. The 1981 revised FEMA flood map indicates both the processing facility and the reuse site are located outside of the 100-year floodplain.

The Great Western Canal is adjacent to the northwest boundary of the reuse site and is elevated above the reuse fields. A large region to the west of Idahoan Foods and the Idaho Falls area is known to have spring melt runoff from west to east, toward the Great Western Canal, Idahoan Foods, and the Snake River. The canal and other 'drains' west of the facility capture the regional runoff prior to reaching Idahoan's property or reuse site. Additionally, Idahoan Foods has constructed 'run-on' control structures along the northern and western boundaries of its reuse site to re-route any regional runoff around the reuse site.

4.5 Ground Water/Hydrogeology

The Idahoan Foods – Idaho Falls facility is located above the Eastern Snake River Plain Aquifer, which is approximately 165 feet deep and flows in a south-southwest direction under the reuse site. Alluvium soils overly basalt and fractured basalt. Well logs for on-site monitoring wells indicate basalt layers are first encountered between 5-15 feet below ground. Two of the monitoring wells indicate a 5-7 foot thick clay lens in the vadose zone between 110 and 130 feet deep. Annual report data shows static water levels of the aquifer range between 165 feet deep in the spring to 145 feet deep in the fall, indicating influence from regional recharge during the irrigation season. The hydraulic gradient of the aquifer is around 0.02 ft/ft on the upgradient portion of the site, reducing to approximately 0.001 ft/ft on the downgradient portion. It is estimated that ground water underneath the reuse site is replaced roughly twice per year due to the high hydraulic conductivity.

This facility has had high constituent loading rates since the first permit was issued in 1990, but impacts have not been seen in the monitoring data. Monitoring well data has not shown any significant impacts or changes to ground water quality since the wells were installed. As shown in Figures 3 – 6 below, there is very little difference between up- and down-gradient ground water quality. The previous permit LA-000010-04 issued in 2004 required an extensive hydrogeologic investigation to try and determine if either hydraulic and/or nutrient overloading was causing any environmental impacts, or if perching was occurring and possibly carrying contaminants offsite in a direction where impacts would not be seen in the monitoring well network. Although two of the monitoring wells have drill logs showing a clay lens in the vadose zone, the investigation found no perched water zones, and determined that the high hydraulic conductivity is likely the reason ground water impacts are not seen. Ground water at this site moves fast. It is estimated that ground water is replaced under the reuse site twice per year due to the high hydraulic conductivity.

Additional ground water monitoring data collected since the current permit LA-000010-05 was issued in 2009 still show little variation between up- and downgradient monitoring wells, indicating that operation of the reuse site may not be impacting the aquifer. However, a unique situation occurred where the facility suspended operations from 2007-2009, returning to limited production during the 2010 growing season, and full production in 2011. Ground water monitoring continued during the facility shut-down and as shown in the Figure 3 below, ground water TDS concentrations appear to show a response to both the shut-down and the return to full production and land application to the reuse site. What is most interesting is that the upgradient monitoring well MW-1 also shows a response to the facility shut down and re-start. Within about 18 months of shutting the facility down and stopping reuse in 2007, TDS values in all wells including MW-1 dropped to about 250 mg/L which is a fairly common background concentration in the region. Ground water TDS remained at background levels for approximately 3 years, indicating neither the regional agricultural activities nor the Great Western Canal were influencing ground water chemistry. Within about 18 months of Idahoan returning to full production in 2011, TDS values in all wells including MW-1 increased to back to the 250-350 mg/L levels seen prior to the shutdown. Ground water seems to be responding directly to Idahoan's reuse activities. Monitoring well MW-1 is located approximately 450 feet upgradient from the nearest corner of reuse field #3. The reasons for the TDS response in MW-1 have not been provided by Idahoan Foods, although they have confirmed to DEQ that they are

not land applying recycled water to any other un-permitted fields closer to (or upgradient of) MW-1. The reasons why upgradient ground water is responding to Idahoan's reuse operations is unknown at this time, but likely related to the geological characteristics of the site. The vadose zone at the site consist primarily of differing layers of fractured, dense, or hard basalt which include limited clays lenses in some areas. The 2003 hydrogeological investigation did not find any perched zones. It it possible that the cracks and fissures in the basalt layers could be transporting reuse percolate through the vadose zone in unusual or unexpected directions prior to reaching the water table.

Although the regional aquifer seems to be responding to reuse activities from Idahoan Foods, the TDS concentrations remain generally less than 350 mg/L over the long term. The ground water quality standard for TDS is 500 mg/L. Therefore, long-term operation of the facility at current loading rates does not show an increasing trend that would indicate that the ground water standard will be exceeded.

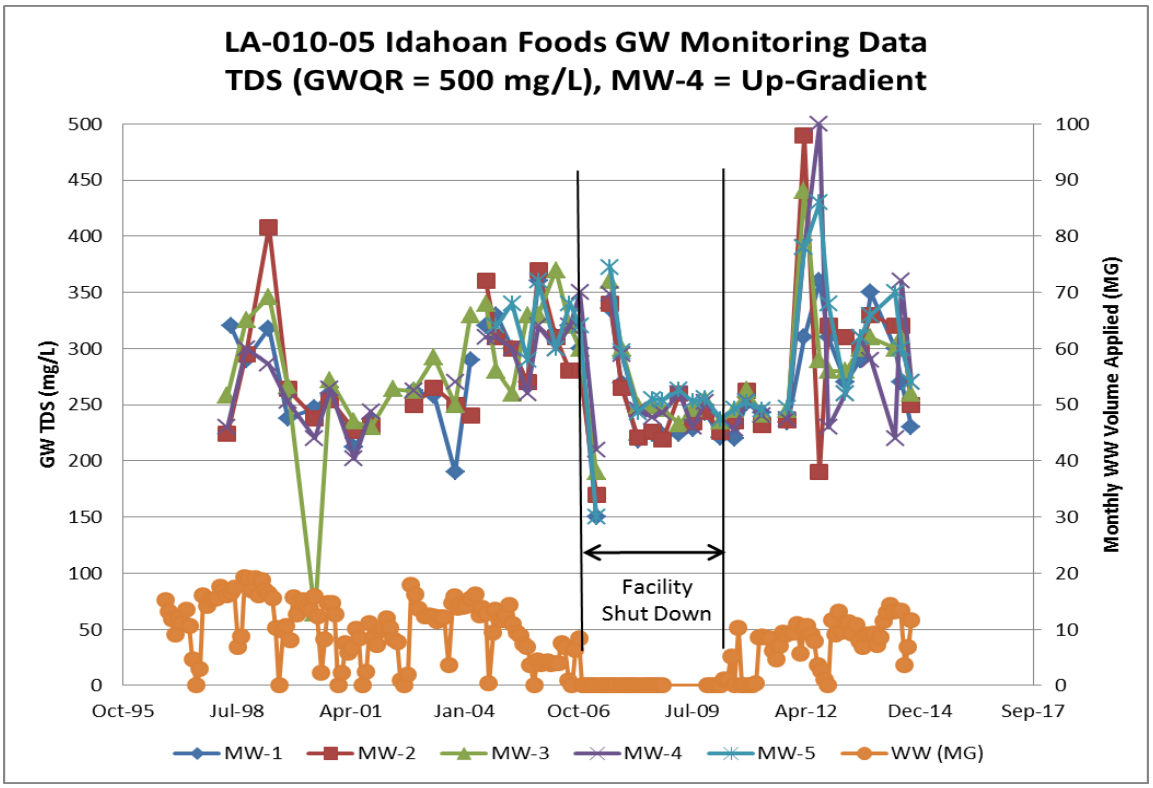


Figure 3. Ground water Total Dissolved Solids (TDS) concentrations.

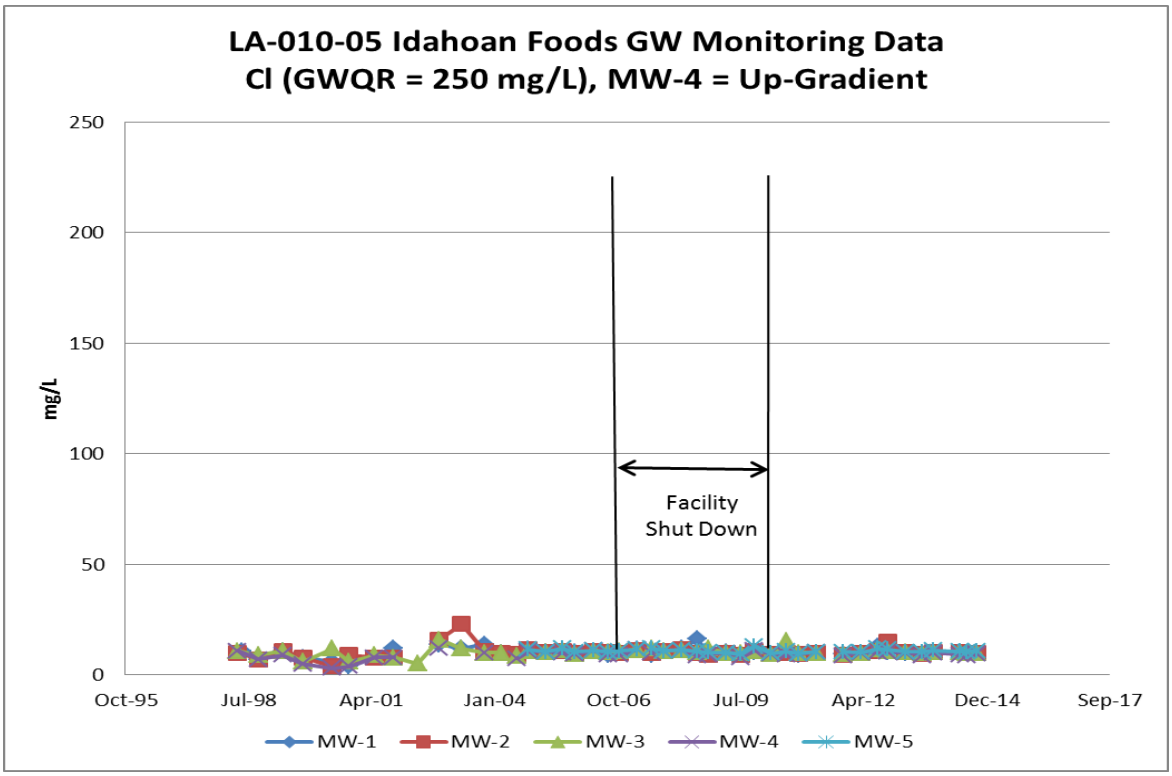


Figure 4. Ground Water Chloride concentrations.

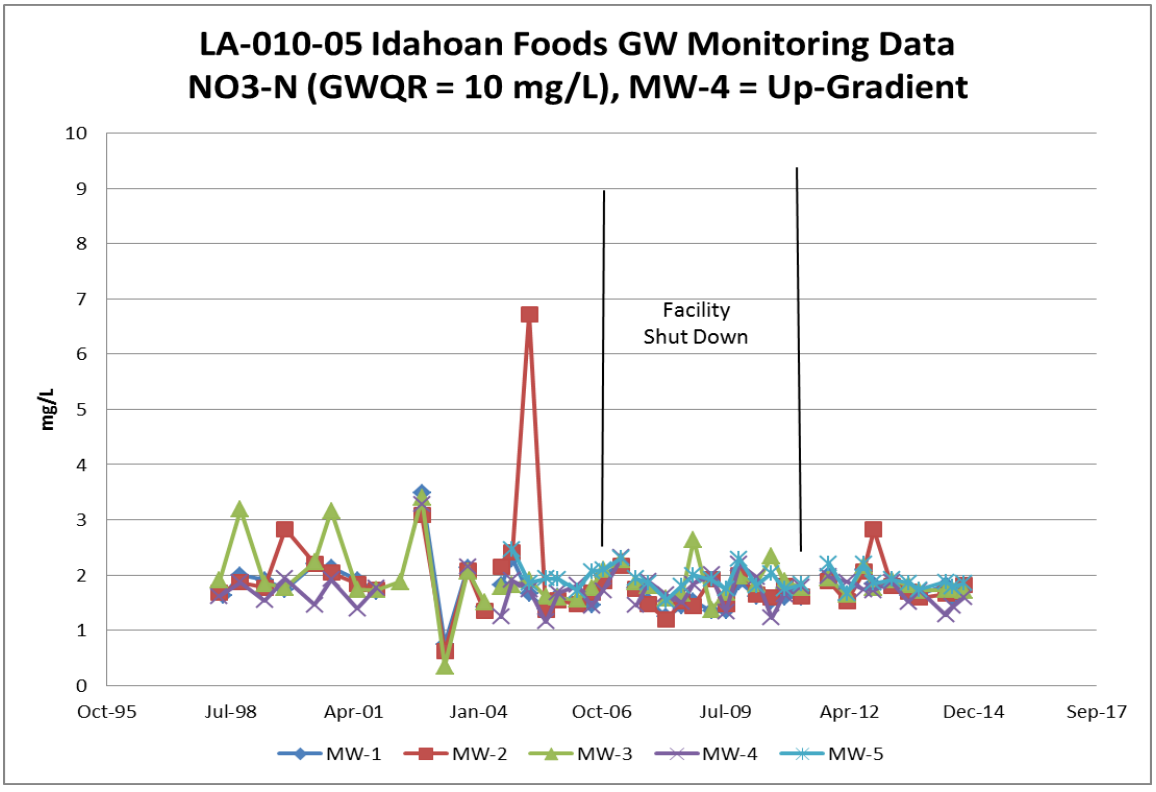


Figure 5. Ground Water Nitrate concentrations.

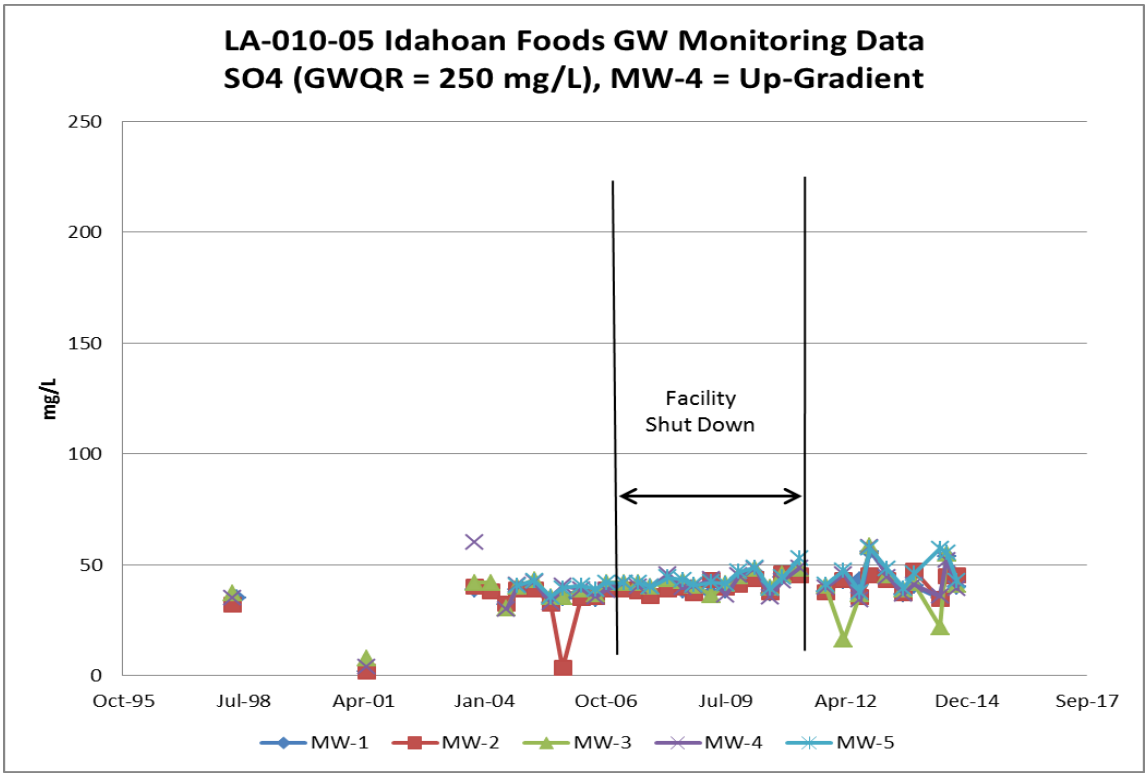


Figure 6. Ground Water Sulfate concentrations. Ground water sulfate is showing an increasing trend in all wells. DEQ has observed this phenomenon in other wells across the region. It is likely not a reuse-specific issue.

Idahoan Foods' public water supply wells are located at the processing facility which is east and hydraulically upgradient of the reuse site. The main well is in the front yard of Idahoan's processing facility, approximately 500 feet upgradient of reuse field #2 (MU-02). The backup well is inside the facility and approximately 600 feet upgradient. Source Water Assessment maps showing the estimated capture zones for the two wells are included in Appendix A at the end of this analysis, and show that the locations of the two supply wells are acceptable.

Idahoan Foods' most recent Plan of Operation (updated 2012) includes a Well Location Acceptability Analysis (WLAA), and all wells were deemed acceptable. There are five residences north of the processing facility and east of the reuse site. The domestic wells for these homes are all upgradient of the reuse system also. The nearest home and domestic well downgradient of the reuse system is approximately 3,000 feet southwest. Tony Christiansen is Idahoan Foods' farm manager and his house is located in the middle of the reuse fields. The domestic well for Mr. Christiansen's home is part of the monitoring well network in the reuse permit and is listed as Monitoring Well MW-3. As shown in Figures 3-6 above, water quality in Mr. Christiansen's well – which is mid-gradient at the reuse site – does not show significant impacts. The other domestic wells closer than 500 feet are all east of the facility and upgradient. Idahoan's permit application states that there are no new homes or wells in the area.

The lack of environmental impacts combined with the recent construction of more efficient irrigation systems that eliminate ponding and runoff indicate the current hydraulic and nitrogen loading limits remain acceptable until any future environmental monitoring indicate otherwise.

4.6 Recycled Water Characterization and Loading Rates

4.6.1 Recycled Water Characterization

Treated process water flow-weighted annual average constituent concentrations and hydraulic loading rates for the years 2011 to 2014 are shown in Table 1 and Table 2.

Table 1.Recycled water concentrations, mg/L.

Year	COD	Ammonia-N	Nitrate-N	TKN	Total P	NVDS
2011	2,411	11.6	<1	112	20.1	712
2012	2,401	12.3	<1	96.2	16.9	684
2013	2,311	11.1	<1	112	22.0	716
2014	2,256	13.1	<1	110	18.1	790
Average	2,345	12.0	<1	107	19.3	726
Std. Dev.	74	0.9		7.6	2.2	45

Table 2. Recycled water hydraulic loading to agricultural reuse.

Year	Flow Rate to Reuse		
	Non-Growing Season (MG)	Growing Season (MG)	Annual (MG)
2011	17.7	53.5	71.2
2012	45.9	35.0	80.9
2013	54.7	64.1	118.8
2014	49.5	76.3	125.8

With the exception of the facility shut-down from 2007 – 2009, recycled water concentrations and flow rates have remained within a consistent window since 2003 ranging between 50 – 150 million gallons per year. Recycled water concentrations have similarly been consistent during that time.

4.6.2 Hydraulic Loading Rates

The 2011 – 2014 hydraulic loading rates for each of the three current reuse fields are shown in Table 3 and Table 4. Historical hydraulic and nutrient loading ranges for each of the reuse fields are shown in Table 5. The approximate ranges for each MU are shown because prior to the irrigation improvements in 2006, the 202.3-acre reuse site consisted of seven MU's instead of three, so data are not directly comparable to the current configuration of management units.

Table 3. Non-Growing Season (NGS) Hydraulic loading rates.

Field	Permit Limit	NGS HLR (inches/acre)			
		2011	2012	2013	2014
MU-1	12.8	3.4	8.6	9.4	10.5
MU-2	12.8	2.9	6.9	9.5	7.8
MU-3	12.8	3.7	10.9	11.5	9.6

Table 4. Growing Season (GS) Hydraulic loading rates.

Field	Permit Limit	GS HLR (inches/acre)			
		2011	2012	2013	2014
MU-1	IWR (35.6 in/ac)	78.4	22.5	27.3	25.7
MU-2	IWR (35.6 in/ac)	19.5	9.7	19.7	25.4
MU-3	IWR (51.8 in/ac)	22.5	32.8	25.7	36.0

Table 5. Historical loading rates. The ranges represent variable loading rates between MU's.

Year	Acres	Annual WW (MG)	NGS WW (in/ac)	Nitrogen Loading		Crop N-uptake (lb/ac)	Dry Yield (ton/ac)	Crops
				(lb/ac)	(as a % of crop N-uptake)			
1997	202.3	120	9-19	270-740	310-1,900	40-190	4-19	Grass, barley, potatoes, corn silage
1998	202.3	180	11-21	690-890	190-740	110-400	4-12	Grass, barley, corn silage
1999	202.3	170	17-32	480-730	230-2,000	30-310	0.6-11	Grass, barley
2000	202.3	150	8-25	320-550	160-420	130-290	3.5-12	Grass, barley
2001	202.3	80	5-15	260-620	60-890	60-400	1.5-6	Grass, barley
2002	202.3	95	7-14	320-520	160-400	130-230	3.5-4.5	Grass, barley, corn silage
2003	202.3	150	8-18	380-850	140-510	100-400	2.5-5	Grass, alfalfa, corn silage
2004	202.3	150	8-21	600-1,150	290-1,020	110-260	3.8-4.5	Grass, barley, potatoes
2005	202.3	100	6-12	410-520	120-390	110-450	2.8-7	Grass, barley, corn silage
2006	202.3	54	2-5	200-400	110-790	30-210	1-5	Grass, barley
2007	202.3	Closed						
2008	202.3	Closed						
2009	202.3	Closed						
2010	202.3	18	0	30-110	20-100	100-200	<0.1	Grass, alfalfa
2011	202.3	71	3-4	270-320	100-140	220-280	3-5	Grass, alfalfa
2012	202.3	80	7-11	280-370	100-180	210-280	2.7-4.3	Grass, alfalfa
2013	202.3	120	9-12	520-590	150-260	220-340	3.7-6	Grass, alfalfa
2014	202.3	125	8-11	520-690	200-300	230-270	3.6-6	Grass, alfalfa

The high hydraulic and nitrogen loading rates and low crop nitrogen uptake rates for 1997-2003, shown in Table 5, were a concern during the 2003 re-permitting process when the current limits were established (nitrogen loading = 600 lb/ac, NGS hydraulic loading = 12.8 in/ac). Generally, high loading rates combined with low crop nitrogen uptake rates will result in ground water impacts. But at this facility, ground water impacts (increasing concentrations from upgradient to downgradient as a result of reuse) were not seen in the long term monitoring well data. So the 2003 permit allowed the high nitrogen and NGS hydraulic loading rates mentioned above, pending the outcome of a comprehensive hydrogeological investigation. The investigation was performed to look for perched zones, under the belief that the layers of hard basalt and sporadic clay lenses might be perching or holding the percolate and preventing it from reaching ground water where impacts would normally be expected. However, no perching layers were found and it was determined that the most likely reason for the lack of ground water impacts under this high-load reuse system was the high hydraulic conductivity and fast-moving nature of the aquifer beneath the site.

The permitted nitrogen loading limit of 600 lb/ac and NGS hydraulic loading limit of 12.8 in/ac have been in place for 12 years (since 2003). Hydraulic loading rates during the Non-Growing Seasons of the last permit cycle were less than the permitted limit of 12.8 inches/acre. Recall that the facility was closed 2007 – 2009 with limited operation during the 2010 growing season and return to year round production in 2011. As discussed in Section 4.3, the Available Water-holding Capacity (AWC) of the site soils is about 8.8 inches. The permitted NGS hydraulic loading rate of 12.8 inches does exceed the AWC by almost 50%. As mentioned above, the high loading was discussed at length during the 2003 permitting process, and determined to be allowable based on the hydrogeological characteristics and lack of ground water impacts at this facility. Monitoring data collected since 2003 suggest the current loading rates remain acceptable based on the lack of impacts. Staff recommends that the currently permitted NGS hydraulic limit of 12.8 inches/acre remain in the new permit until environmental monitoring data suggest changes are needed.

Table 4 shows that all reuse fields have generally been under-irrigated during the growing seasons of 2011 – 2014 with the exception of MU-1 in 2011. Field #1 (MU-1) and Field #2 (MU-2) consist of center pivots with big-guns in the corners. Field #3 (MU-3) is irrigated entirely with big guns. The Irrigation water requirements (IWR) listed in Table 4 are based on a crop of grass hay with irrigation efficiencies of 80% for the pivot fields and 55% for the big gun field. The IWR values and information provided in recent annual reports from Idahoan indicate Idahoan's IWR tables may be outdated, and possibly are not being used by the facility to project and schedule monthly irrigation loads in advance, which could be part of the reason the fields appear to be under-irrigated during the summer. Further discussion of irrigation scheduling is provided in Section 5.9.

Staff recommend the new permit continue with a Growing Season hydraulic loading limit substantially at the Irrigation Water Requirement. It is recommended that the revised Plan of Operation include updates to the irrigation scheduling process that Idahoan Foods will employ to ensure the crops are adequately irrigated during the summer growing season. Using precipitation deficit (Pdef) data from the ET Idaho website and developing, in advance, the monthly irrigation water requirement (IWR) needs for each field should help the facility pre-emptively schedule and plan for both the recycled water and supplemental irrigation needs of the crops well in advance. Idahoan Foods should review and revise its irrigation management procedures to better meet the crop's irrigation demands, which should also improve crop yields and nutrient uptake.

4.6.3 Constituent Loading Rates

Treated process water annual average constituent loading rates and crop yields for each of the reuse fields for the years 2011 through 2014 are shown in Table 6.

Table 6. Average constituent rates, 2011 to 2014.

	Permit Limit	Field #1	Field #2	Field #3
		MU-010-01	MU-010-02	MU-010-03
NGS Hydraulic Loading, in/ac	12.8	8.0	6.8	8.9
GS Hydraulic Loading, in/ac	IWR[a]	25.2	18.6	29.3
Crop Dry Yield, lb/ac		7,032	10,319	8,062
Nitrogen Uptake, lb/ac		227	293	247
Nitrogen Loading, lb/ac	600	482	398	449
Nitrogen Loading as a % of Uptake		213%	136%	180%
NGS COD Loading, lb/ac-day	50	30	26	33
GS COD Loading, lb/ac-day	50	27	22	22
NVDS Loading	4,500	2,900	2,500	2,700

a. IWR limits for grass/alfalfa mix are approximately 36 in/ac on Field #1 and #2, and 52 in/ac on #3.

As discussed in Section 4.6.2, and shown in Table 5, high nitrogen and hydraulic loading rates were a concern and evaluated extensively during the 2003 re-permitting process. Even when high NGS hydraulic and nitrogen loading occurred when irrigating low-nitrogen crops like barley, ground water did not respond negatively. While the data is clear that the crop s are not effectively treating all the nitrogen applied as generally recommended, the data also show that ground water is not being impacted by current operations. So, while planting high nitrogen consuming crops and maximizing nitrogen uptake is still encouraged, it appears that ground water impacts are not likely even if Idahoan reverts to a different, lower performing, crop for a short period of time (perhaps for crop-rotation purposes). If the facility reverts to low performing crops on a consistent basis, which would reduce nitrogen treatment and increase the potential for impacts, then DEQ may re-evaluate at that time and issue a permit modification to convert to a performance-based nitrogen loading limit based on a percentage of crop uptake.

Staff recommend maintaining the currently permitted limits in the new permit. Nitrogen and COD loading rates remain well within permit limits and are fairly consistent year after year. The facility is generally applying less water than allowed in both the non-growing and growing seasons. The reduced hydraulic loading during the NGS more closely matches the soil water holding capacity of about 8.8 inches, which helps reduce percolate losses.

One area of concern is that growing season hydraulic loading rates have been less than the crop irrigation needs (IWR) during the summer, as described previously in Section 4.6.2. It would be expected that crop yields and nutrient uptake rates would improve if growing season irrigation schedules were improved to more closely match the irrigation demands of the crops. Evidence of under-irrigation can be seen in the time lapse satellite photos available on Google Earth and shown in Figures 7-12. Pivot #1 (field #1) especially exhibits dry conditions in the year-after-year images. Field #1 images show both an under-irrigation scenario as well as potentially plugged sprinkler nozzles.

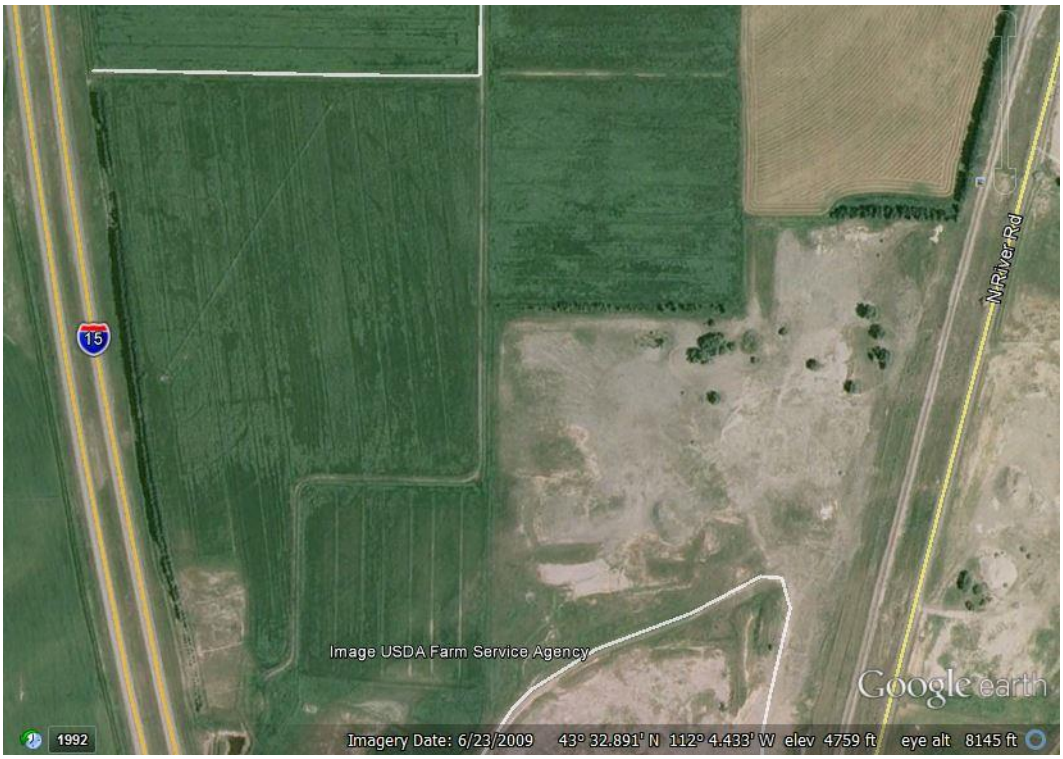


Figure 7. August 2009 image showing Pivot #1 three years after conversion from flood to pivot irrigation. The field looks healthy and evenly-irrigated.

Figure 8. August 2010. Notice dry 'pie' area on north side of pivot. The distinctive line between the wet and dry area of the pie indicates the pivot was likely being shut off prior to reaching the field boundary on the west side.

Figure 9. August 2011. The dry circles are closed, part-circle, or re-directed sprinklers at the wheel towers to try and keep the wheel tracks dry. But notice the dry areas between the towers, which can indicate that sprinkler sizes may have been designed too small, or the correct nozzles were replaced with nozzles that are too small.

Figure 10. September 2012. There are large dry areas between the first and second tower, and between the second and third tower. Idahoan Foods should perform maintenance and check all sprinkler heads and nozzles to ensure that they are still the correct size as shown on the 'sprinkler chart' that was provided with the pivot at installation.

Figure 11. August 2013. The brown dry circle between the first and second tower indicates a plugged sprinkler nozzle. The dark green ring next to it indicates an oversized or missing nozzle (or a leak) that is over-applying. The large brown circles at tower #3 and #6 also indicates multiple sprinkler nozzles that are plugged or under-sized.

Figure 12. October 2014. The narrow dark green circle between tower 2 and tower 3 indicates a broken pipe or missing sprinkler nozzle where the sprinkler supply pipe is likely discharging water directly to the ground without passing through a sprinkler nozzle or its distribution plate. The other small green circles that are in-line in a spoke pattern indicate locations where the pivot was shut off and each tower drained on the ground.

5 Site Management

5.1 Buffer Zones

An approved Buffer Zone Plan has been in place at this facility since 2003,through two permit cycles for LA-000010-04 (issued 2003) and LA-000010-05 (issued 2009). No new homes, wells, roads or other points of concern have been constructed since that time.

The current permit specifies the normally recommended buffer distances of 1,000 feet to a public water supply, 500 feet to a private domestic well, 300 to a dwelling, 100 feet to surface water, 50 feet to ditches and canals, and 50 feet to public access areas.

The two public water supply wells at the Idahoan Foods facility have been evaluated by DEQ's Source Water Assessment program, and that assessment indicates that the wells are positioned upgradient of the reuse site. The Source Water Assessment maps for both wells are included in Appendix A of this analysis for reference.

The Buffer Zone Plan is provided in the facility's most recent (August 2012) update to its Plan of Operation. The Buffer Zone Plan also includes a Well Location Acceptability Analysis (WLAA) of the homes within ½ mile of the reuse site.

The Buffer Zone plan lists 14 houses within ½ mile of the reuse site. Six of the homes are closure than 1,000 feet and the mitigation measures for each of them are described in the plan.

The closest home is listed as H-3, the Idahoan Foods farm manager house. H-3 is in the middle of the reuse site and is approximately 50 feet from the irrigation system. The house well is part of the reuse permit ground water monitoring network and is listed as monitoring well MW-3 (GW-010-03). As discussed in Section 4.5 ground water impacts are not occurring at this facility so the well was deemed acceptable in the WLAA. Mitigation measures to control wind drift from irrigation systems include a mature stand of poplar trees and bushes surrounding the home.

The other five homes closer than 1,000 feet to the reuse site are located north of the processing facility and east of the reuse site. All of the homes are hydraulically upgradient, but downwind of the reuse site. Idahoan has a mature stand of poplar trees along the eastern edge of Field #3 to serve as a mitigation measure to prevent wind drift and odors from the reuse system. Homes H-4 and H-5 are 320-350 feet east of Field #3, their wells are closer than 500 feet but are upgradient, and Idahoan's vegetative buffer eases odor concerns. Homes H-2, H-6 and H-7 are 500-700 feet east of Field #3 and meet recommended buffers, their wells are upgradient, and Idahoan's vegetative buffer eases odor concerns.

The Great Western Canal is elevated and runoff potential from the reuse site into the canal is not a concern. Monitoring wells are all located outside of the active land application areas and appear slightly elevated to prevent ponding around the well casings. And the only points of potential public access would be along the edge of Interstate 15 to the west and along the railroad tracks which border the east side of the reuse site – both of which are greater than 50 feet from the reuse site and neither of which pose a high probability for public access since cars generally don't stop along the interstate and the railroad tracks are private property with no trespassing.

The current buffer zone plan and Idahoan's mitigation measures appear to be adequate. It is also noted that DEQ has no record of receiving an odor complaint against the Idahoan Foods Idaho Falls facility.

5.2 Runoff

Idahoan Foods' current Plan of Operation addresses runoff and run-on. The reuse site includes berms around each field to prevent runoff to unpermitted areas. Also, the facility has constructed a ditch around the northern and western sides of the site to prevent run-on from the regional snowmelt that occurs on the farmland west and northwest of the facility. Any potential 'run-on' is caught in the ditch and diverted around Idahoan Foods' facility.

The current permit LA-000010-05 requires runoff control structures and other BMP's to prevent runoff from the site except in the event of a 25-year, 24-hour storm event. The run-on and run-off control structures that are in place appear to be able to meet this requirement. No changes are recommended at this time.

5.3 Seepage Rate Testing

A new reuse water and irrigation storage lagoon with a 60 mil HDPE liner was constructed as part of the irrigation system upgrades in 2005 and 2006. The lagoon was seepage tested upon completion of construction in 2006 and the results indicated a seepage rate of 0.012 inches/day which was less than the allowable limit of 0.125 inches/day when the lagoon was constructed. DEQ recommends that wastewater lagoons be seepage tested at least every ten years; therefore, it is recommended that a compliance activity be added to the new permit requiring seepage testing be completed in 2016. Because the lagoon will be ten years old at the next test, it is recommended that the ¼-inch per day seepage rate be set as the maximum allowable limit for this industrial wastewater lagoon. The compliance activity establishes that testing must be completed by the end of August 2016 (prior to freezing conditions). It also establishes a requirement for the testing engineer or geologist to submit the testing procedure to DEQ for review at least 42 days prior to the anticipated testing date. The seepage test will need to be designed and administered under the direct supervision and responsible charge of an Idaho licensed professional engineer (P.E.) or professional geologist (P.G.). Information on seepage testing procedures are located at: *http://www.deq.idaho.gov/water-quality/wastewater/lagoon-seepage-testing.aspx*

5.4 Waste Solids, Biosolids, Sludge, and Solid Waste

Waste Solids at the Idahoan Foods Idaho Falls facility are managed according the Waste Solids Management Plan that is currently in place and described within the facility's most recent revision to its Plan of Operation, dated August 2012. In general, the Waste Solids Management

Plan describes three main sources of waste: refuse solid waste, animal feed solid waste, and dirt/mud/rock solid waste. Refuse (trash) is taken to the county landfill. Animal feed solid waste (cull potatoes and other 'edible' materials from the processing system) is sold and delivered to cattle feed lots. And the rocks/vines/mud are hauled to fill in the old, dry lagoons behind the facility or possibly applied to the land application fields to fill in low spots.

During the 2013 DEQ inspection, concerns were noted about the shallow soils on Field #1 and its lack of water holding capacity, and their desire to land apply the tare dirt and mud to the field to build up the soil. Adding the waste solids to the hydraulic management unit is acceptable provided the facility monitor, measure, track, and document the volumes and nutrient loads applied to the reuse field. The additional nutrients applied to the field from the waste solids must be accounted for and will require that recycled water nutrient loads be reduced in order to maintain a combined total nitrogen loading of less than 600 lb/acre-year from all sources.

5.5 Nuisance Odors

A nuisance odor management plan is included in the facility's most recent Plan of Operation, dated August 2012. The plan addresses plant operation and maintenance procedure to prevent the creation of nuisance odors, as well as processes and procedures that the facility will follow in the event that they receive a nuisance odor complaint. DEQ has no record of receiving a nuisance odor complaint against their Idaho Falls facility. It appears that nuisance odors are either not being generated or are not affecting downwind neighbors. Therefore, the current nuisance odor management plan appears to be adequate and no changes are recommended at this time.

5.6 Cropping Plan

Crop rotations are described in the facility's most recent Plan of Operation, dated August 2012. The facility plans to continue growing a grass/alfalfa mixture with periodic rotations of grain, oats, or silage corn on a 4-5 year cycle.

5.7 Grazing

The facility's Grazing Management Plan is included in the facility's most recent Plan of Operation, dated August 2012 and appears to be working well. The facility grazes cattle only for a short period during the late fall as a 'fall cleanup' site maintenance activity, and not as a nutrient removal strategy. The plan has worked well for many years and no changes are recommended.

5.8 Salts

As described in Section 4.6.3, Non-Volatile Dissolved Solids (NVDS, or 'salt') loading is limited in the current permit to 4,500 lb/ac-year. The average salt loading to the reuse sites from 2011-2014 was less than 3,000 lb/ac-year. Annual data going back to 1997 shows, with very limited exception, that salt loading to the reuse fields has remained less than 4,000 lb/ac-year. Soil monitoring data do not show a salt buildup concern. Salt loading is not a concern at this time and staff recommend removing the current salt loading permit limit of 4,500 lb/ac-yr.

5.9 Other (silvicultural plan for forest sites, emergency operating plan(s), irrigation management)

As described in Section 4.6.3, the reuse site appears to be under-irrigated during summer. Data from the past four years show that all three fields are generally not irrigated enough to substantially follow or meet the irrigation water requirement (IWR, or irrigation demand) of the crops being grown. Figures 13 – 15 are from DEQ's review of Idahoan Foods' 2014 annual report and show a comparison between the 30-year average irrigation demand (IWR) and the actual 2014 irrigation rates to each field (Total HLR). The pattern shown on these graphs is consistent with data from previous years, which show the fields being under-irrigated during the summer months.

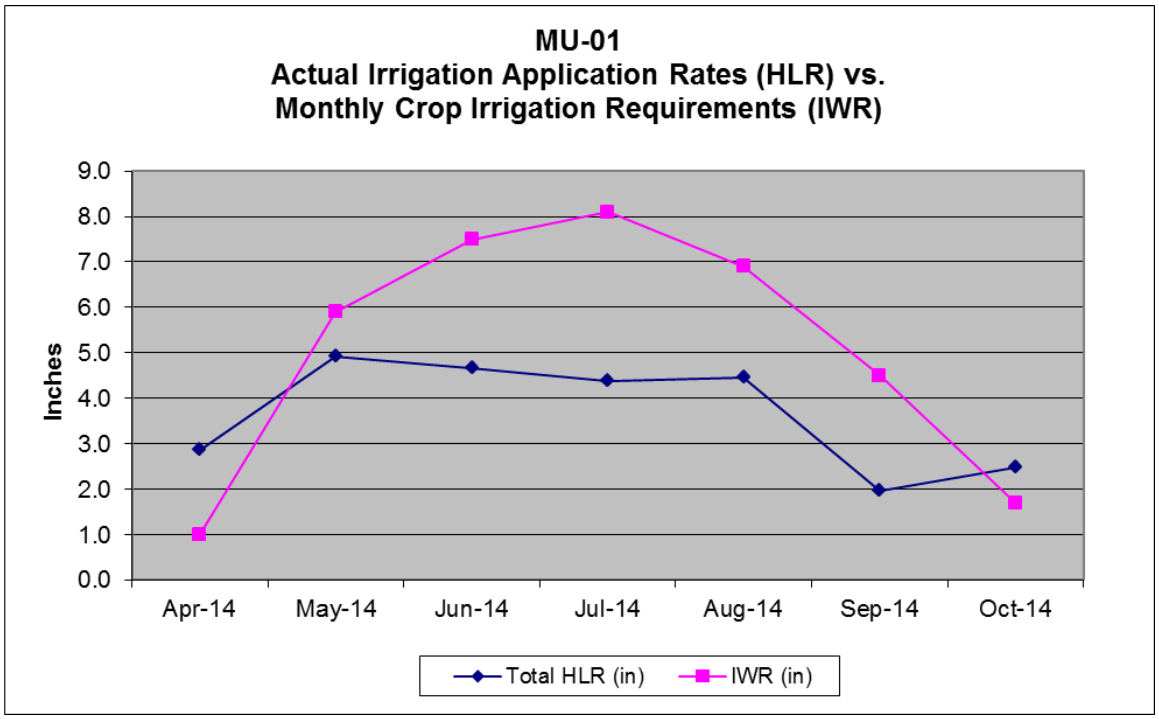


Figure 13. Field #1 actual irrigation rate (Total HLR) vs. the crop's irrigation needs (IWR) in 2014.

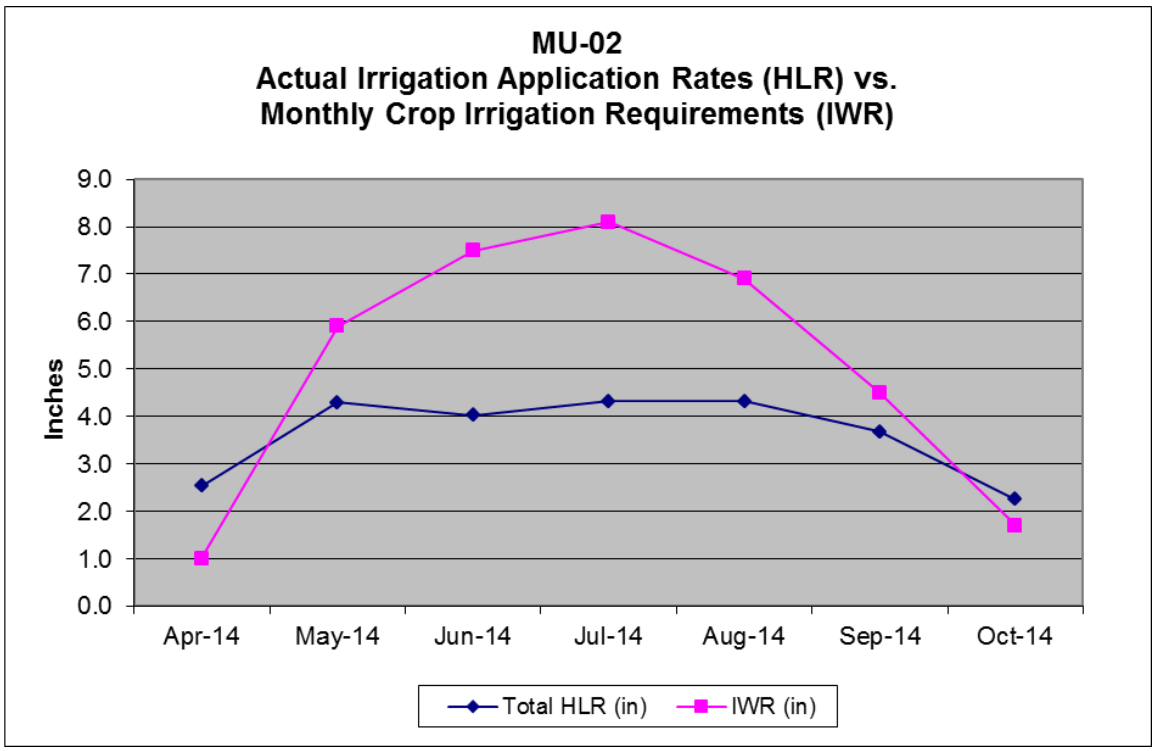


Figure 14. Field #2 actual irrigation (Total HLR) vs. the crop's irrigation needs (IWR) in 2014.

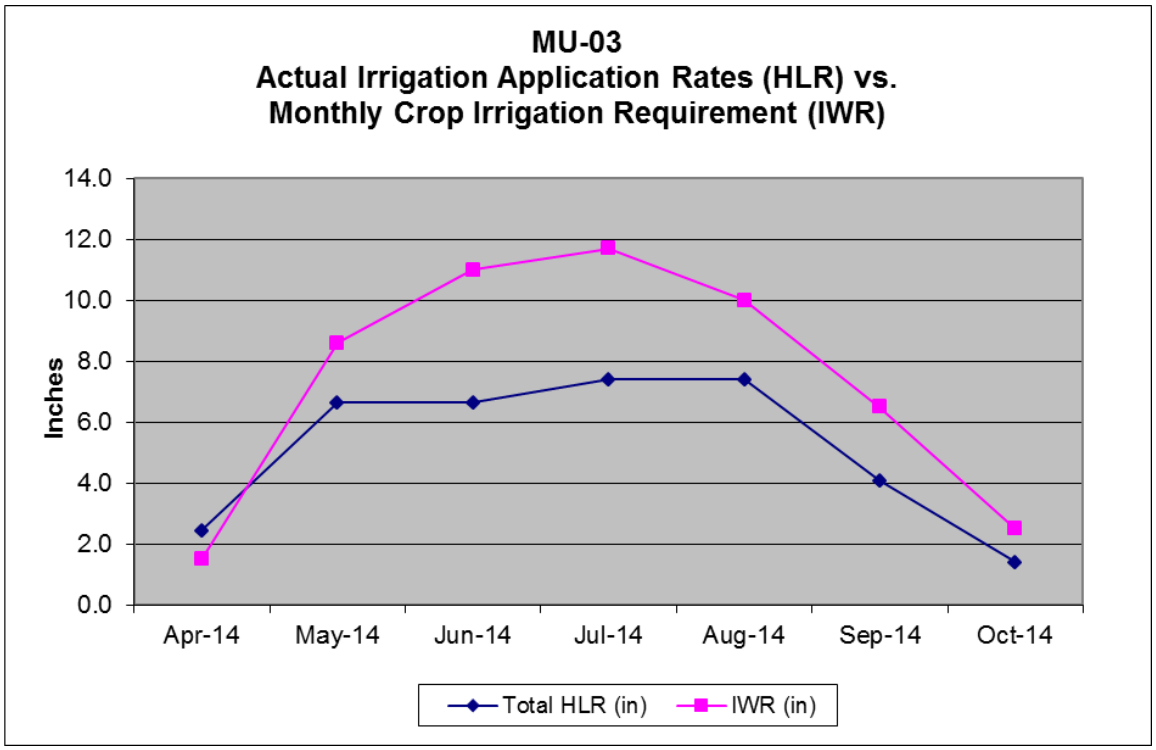


Figure 15. Field #3 actual irrigation (Total HLR) vs. the crop's irrigation needs (IWR) in 2014.

Although Section 5.4 discusses Idahoan's desire to add waste solids tare dirt and mud to field #1 to build up the water holding capacity of the soil, it may be more effective to improve irrigation schedules to ensure that the irrigation demand of the crops are being met during the heat of summer. Annual report data shows that all three fields are consistently under-irrigated each year.

Staff recommend that the revised Plan of Operation required in the new permit include an *Irrigation Management and Scheduling Plan* that provides updated Irrigation Water Requirement (IWR) tables for each crop expected to be grown at this facility. The tables should include the Monthly IWR's, in inches/acre and gallons, for each crop, each field, for each month of the growing season (April – October). The tables should be developed using the 30-year average Precipitation Deficit (Pdef) data from the University of Idaho's ET Idaho website for the Idaho Falls FAA weather station, with an irrigation efficiency of 80% for Fields #1 and #2, and 55% for big-gun Field #3.

Developing new IWR tables will create a management tool that is available for use in advance of every summer month, every year. Idahoan Foods will be able to refer to the table months or even years in advance to pre-emptively plan both the facility productions rates and supplemental irrigation volumes that will be required each month of the growing season. Providing the irrigation rates that the crops demand should also lead to improved crop health, better yields, and greater nitrogen uptake rates. Table 6 provides an example showing how to construct monthly IWR irrigation schedules for alfalfa, grass hay, field corn, and winter wheat using the irrigation efficiencies in place at Idahoan's Idaho Falls facility.

Table 6. Irrigation Water Requirement (IWR) example.

								IRRIGATION WATER REQUIREMENTS	
		Crop Irrigation Water Requirements (IWR) Data Source: ET Idaho (www.kimberly.uidaho.edu/ETIdaho)							
		Station Type (NWS NOAA, Agrimet, etc.)						**NWS NOAA**	
		Station Name (Hagerman 2SW, etc.)						**Idaho Falls FAA Apt**	
		Station Identifier (104457, RXGI, etc.)						**104457**	
Land Cover Dataset (Alfalfa, etc.)	**Alfalfa - Frequent Cuttings**	Apr	May	Jun	Jul	Aug	Sep	Oct	GS
Mean Monthly Precip. Deficit (Pdef), mm/day		0.68	3.88	5.11	5.28	4.52	3.05	1.13	Totals
Mean Monthly Precip. Deficit (Pdef), inches/month		0.8	4.7	6.0	6.4	5.5	3.6	1.4	28.5
Irrigaiton Water Requirement (IWR) at Ei = 55%, inches/month		**1.5**	**8.6**	**11.0**	**11.7**	**10.0**	**6.5**	**2.5**	**51.8**
Irrigation Water Requirement (IWR) at Ei = 80%, inches/month		**1.0**	**5.9**	**7.5**	**8.1**	**6.9**	**4.5**	**1.7**	**35.6**
Land Cover Dataset (Alfalfa, etc.)	**Grass Hay**	Apr	May	Jun	Jul	Aug	Sep	Oct	GS
Mean Monthly Precip. Deficit (Pdef), mm/day		0.76	3.36	5.68	6.12	4.58	3.13	0.52	Totals
Mean Monthly Precip. Deficit (Pdef), inches/month		0.9	4.1	6.7	7.5	5.6	3.7	0.6	29.1
Irrigaiton Water Requirement (IWR) at Ei = 55%, inches/month		**1.6**	**7.5**	**12.2**	**13.6**	**10.2**	**6.7**	**1.2**	**52.9**
Irrigation Water Requirement (IWR) at Ei = 80%, inches/month		**1.1**	**5.1**	**8.4**	**9.3**	**7.0**	**4.6**	**0.8**	**36.4**
Land Cover Dataset (Alfalfa, etc.)	**Field Corn**	Apr	May	Jun	Jul	Aug	Sep	Oct	GS
Mean Monthly Precip. Deficit (Pdef), mm/day		0.02	0.01	0.88	4.07	5.92	3.80	0.84	Totals
Mean Monthly Precip. Deficit (Pdef), inches/month		0.0	0.0	1.0	5.0	7.2	4.5	1.0	18.8
Irrigaiton Water Requirement (IWR) at Ei = 55%, inches/month		**0.0**	**0.0**	**1.9**	**9.0**	**13.1**	**8.2**	**1.9**	**34.1**
Irrigation Water Requirement (IWR) at Ei = 80%, inches/month		**0.0**	**0.0**	**1.3**	**6.2**	**9.0**	**5.6**	**1.3**	**23.5**
Land Cover Dataset (Alfalfa, etc.)	**Winter Wheat**	Apr	May	Jun	Jul	Aug	Sep	Oct	GS
Mean Monthly Precip. Deficit (Pdef), mm/day		1.11	2.73	6.16	6.88	2.54	0.37	0.05	Totals
Mean Monthly Precip. Deficit (Pdef), inches/month		1.3	3.3	7.3	8.4	3.1	0.4	0.1	23.9
Irrigaiton Water Requirement (IWR) at Ei = 55%, inches/month		**2.4**	**6.1**	**13.2**	**15.3**	**5.6**	**0.8**	**0.1**	**43.5**
Irrigation Water Requirement (IWR) at Ei = 80%, inches/month		**1.6**	**4.2**	**9.1**	**10.5**	**3.9**	**0.5**	**0.1**	**29.9**

6 Monitoring

Monitoring Requirements at Idahoan Foods Idaho Falls have remained the same for the past two permit cycles. Idahoan has proposed that the new permit maintain the same monitoring parameters. DEQ's review of the monitoring requirements and recommended changes are as follows.

6.1 Recycled Water Monitoring

The current permit retained the same recycled water monitoring parameters that have been in place since the previous permit LA-000010-04 was issued in 2003. The monitoring parameters are chemical oxygen demand, total Kjeldahl nitrogen, ammonia nitrogen, nitrate nitrogen, total phosphorus, total dissolved solids, volatile dissolved solids, non-volatile dissolved solids, electrical conductivity, and pH. Idahoan Foods proposes to maintain the same monitoring parameters for the next permit cycle; however, in the 2013 inspection report DEQ's inspector recommended discontinuing nitrate monitoring due to miniscule concentrations (typically much less than 1% of the total nitrogen concentration), and ammonia because it's a subset of the Total Kjeldahl Nitrogen (TKN) measurement. Discontinuing nitrate nitrogen monitoring is acceptable due to the very low concentration. But staff recommend continuing with ammonia monitoring for two reasons. The first is that measuring both ammonia and TKN helps distinguish between the organic and mineral fractions of nitrogen in the recycled water stream (ammonia is around 15% of the total nitrogen concentration at this facility). The second is that the ammonia concentration must be known in order to calculate the Plant Available Nitrogen (PAN) loading that is available in the recycled water.

The recommended recycled water monitoring parameters for the new permit I-010-06 remain similar to the previous two permits and are: Chemical Oxygen Demand (COD), Total Kjeldahl Nitrogen (TKN), Ammonia Nitrogen (NH3), Total Phosphorus (P), Total Dissolved Solids (TDS), Volatile Dissolved Solids (VDS), Non-Volatile Dissolved Solids (NVDS), Electrical Conductivity (E.C.), and pH. Nitrate nitrogen monitoring will be discontinued.

6.2 Soil Monitoring

Soil monitoring has also consisted of the same parameters since 2003 and includes twice yearly (April and October) monitoring of electrical conductivity, pH, nitrate, ammonium, phosphorus, potassium, organic matter, iron, manganese, and the sodium adsorption ratio (SAR). The 2013 DEQ inspector recommended elimination of fall soil sampling due to its limited efficacy, and elimination of SAR monitoring since long-term data do not show salt or sodium concentrations increasing to levels of concern. A review of long term soil monitoring data also does not show environmental concerns. Staff support reducing the monitoring schedule to once per year in the spring. Spring sampling will help establish nutrient levels and potential needs for supplemental fertilization as well as track trends over time. Staff also support removal of SAR monitoring since soil data from 2004 through 2014 do not show a trend of increasing sodium levels, and the

continuation of electrical conductivity measurements will adequately serve as a gage to track potential salt buildup.

The recommended soil monitoring schedule for the new permit I-010-06 is once per year in March. The parameters to be monitored include: pH, organic matter, nitrate nitrogen, ammonium nitrogen, plant available phosphorus, potassium, and electrical conductivity. Fall soil sampling and SAR monitoring will be discontinued.

6.3 Ground Water Monitoring

Idahoan Foods has five monitoring wells consisting of four dedicated monitoring wells and one mid-gradient domestic well that also serves as the reuse farm manager's house well. The monitoring network and parameters have been in place for two permit cycles and appear to be adequate for evaluating ground water quality at the reuse site. There is one upgradient monitoring well (MW-4), one mid-gradient domestic well (MW-3) and three downgradient monitoring wells (MW-1, MW-2, MW-5). Staff recommend that the current network of five wells be retained for monitoring in the new permit. The 2013 DEQ inspector recommended discontinuing monitoring of sulfates and chloride. Staff recommend retaining sulfate because data in Figure 6 shows an increasing trend over the long-term, including the upgradient MW-1 which might indicate a regional issue rather than a reuse-specific issue. Staff agree that chloride monitoring can be discontinued. Figure 4 shows that chloride concentrations in all wells remain at background levels and show no change over the long-term.

Ground water is deep at this location with little irrigation influence during the summer months and limited downgradient domestic wells. So staff recommend discontinuing the summer ground water monitoring event and returning to a twice per year monitoring schedule in April and October.

The recommended ground water monitoring schedule for the new permit I-010-06 is twice per year (April and October) with the following monitoring parameters: water table depth, water table elevation, pH, specific conductivity, temperature, nitrate nitrogen, total phosphorus, total dissolved solids, total and dissolved (filtered) iron, and total and dissolved (filtered) manganese. July ground water sampling and chloride analysis will be discontinued.

In order to characterize and track key signatures and potential changes to the regional aquifer over time, staff also recommend limited sampling of the following parameters during the first and last year of the new permit: chloride, sulfate, sodium, potassium, calcium, magnesium, and alkalinity.

6.4 Supplemental Irrigation Water Monitoring

Nutrients and salts from the Great Western Canal have been monitored by Idahoan Foods since 2004. Monitoring data for nitrogen, phosphorus, and salts show miniscule concentrations at least an order of magnitude less than the recycled water concentrations. Total nitrogen ranges from

non-detect to about 0.3 mg/L. Total phosphorus has remained less than detection (0.05 mg/L) for five years. And total dissolved solids average about 150 mg/L (ground water background TDS is 250-350 mg/L and recycled water TDS is 1,500-2,000 mg/L). Staff recommends discontinuing supplemental irrigation water monitoring and not including the irrigation nutrients and salts in the loading calculations to the reuse site.

6.5 Crop Yield and Tissue Monitoring

Idahoan Foods currently measures and tracks crop yields, tissue concentrations, and nutrient removal rates from each crop, each harvest, each field, each year. Staff recommend the current crop monitoring program be continued in the new permit. The new permit distinguishes between the field parameters that Idahoan's staff must measure and document, and the analytical parameters that will need to be determined by an independent laboratory.

The recommended field parameters include crop type, harvest date, sample collection date, harvested acreage, as-harvested (wet) yield, as-harvested (field) moisture content, and the conversion to dry yield. The as-harvested (field) moisture content has been an implicit requirement in previous permits, but will be explicitly specified in the new permit to ensure that accurate and representative moisture contents will be determined at the time of harvest so that accurate dry yields and nutrient uptake rates can be calculated. Reuse facilities are finding that the as-received moisture value of the sample determined at the laboratory is many times not representative of the crop's moisture level at the time it was harvested and weighed. Staff feel that the on-site moisture measurement method will result in more realistic measurements of moisture content at the time of harvest, which will result in more accurate determinations of dry yields and nutrient uptake rates. A variety of methods and procedures are available to determine field moisture including oven drying, calibrated probes, and the 'microwave method.' Idahoan Foods will need to evaluate and select one method that will be used consistently for the life of the next permit. The sampling, measuring, calculation, and quality control procedures for the selected method will need to be provided in the facility's updated Plan of Operation and Quality Assurance Project Plan (QAPP).

Laboratory analysis of total Kjeldahl nitrogen (TKN), nitrate nitrogen, phosphorus, ash, and as-received moisture content will continue to be required in the new permit, as they have been since 2003. The nutrient values will be used to determine crop uptake rates and permit compliance. The as-received moisture content will be tracked as a point of reference only (for comparison to the field moisture measurement) and won't be used to calculate dry yields or nutrient uptake rates.

6.6 Meteorological Monitoring

Nuisance odors and application during freezing conditions have not been a problem at this facility historically. And run-on/run-off control systems are in place. Meteorological Monitoring is not recommended at this time.

6.7 Calculation Methodologies

Idahoan Food's permit renewal application does not address calculation methodologies. DEQ will use the following methods to determine permit compliance. DEQ recommends the Plan of Operations and QAPP present the specific meters, methods, and equations that will be used.

Hydraulic loading:
Hydraulic volumes of recycled water and supplemental irrigation water to each individual management unit should be recorded daily using the flow meters and hour meters as applicable. Daily volumes should be compiled and reported in monthly, seasonal, and annual volumes.

Per-acre hydraulic application depths should also be documented daily and compiled monthly, seasonally, and annually for each individual management unit based on the actual acreage irrigated in a particular season or year. Hydraulic volumes on each management unit should be converted to application depths as follows:

Application Depth (inches) = (gallons applied) / (acres used x 27,154 gal/ac-in)

Constituent loading:
Recycled water constituent loading to each individual management unit should be calculated and compiled into monthly, seasonal, and annual totals. Monthly loads should be the product of the monthly volume applied to the individual management unit and the monthly compliance sample result from the analytical laboratory, divided by the actual acreage irrigated on the particular management unit as shown below. The monthly loads for each constituent can then be added together to determine seasonal and annual loads for each individual management unit:

Monthly Constituent Loading (lb/acre/month) = [(volume applied in Million Gallons/month) x (monthly constituent concentration in mg/L) x (8.34)] / (Management Unit acres utilized).

Helpful unit conversions include the following:

1 mg/L = 8.34 lb/MG (pounds per million gallons)
1 MG (million gallons) = 36.827 acre-inches = 3.069 acre-feet

Crop Yield:
Crop yields should be individually measured for each cutting on each management unit using truck scale, portable scales, yield monitors, etc. Both as-harvested wet-basis yields, and dry-basis yields should be reported for each individual harvest. The individual dry-basis yields from each harvest or cutting on each management unit (MU) should be added together to report the total seasonal yield for each MU. The per-acre yields for each management unit will be determined as follows. Both wet basis and dry basis yields can be calculated in the same manner:

Management Unit yield/acre = (MU yield in lbs) / (MU acreage utilized)

Nutrient uptake and removal:
Total and per-acre nutrient uptake from each individual yield for each individual management unit should be calculated on a dry-basis by converting the as-harvested wet yield to a dry yield based upon the moisture content of the crop at the time of harvest, using the field moisture value determined at the time of harvest (not the laboratory moisture value). The total dry-basis constituent uptake (in pounds) can then be converted to a per-acre uptake when divided by the actual acreage utilized on the individual management unit.

7 Quality Assurance Project Plan

The Quality Assurance Project Plan (QAPP) is a written document outlining the procedures used by the permitee to ensure the data collected and analyzed meets the requirements of the permit.

In support of the agency mission, DEQ is dedicated to using and providing objective, correct, reliable, and understandable information. Decisions made by DEQ are subject to public review and may at times, be subject to rigorous scrutiny. Therefore, DEQ's goal is to ensure that all decisions are based on data of known and acceptable quality.

The QAPP is a permit requirement and must be submitted to DEQ as a stand-alone document for review and acceptance. The QAPP is used to assist the permittee in planning for the collection, analysis, and reporting of all monitoring data in support of the reuse permit and explaining data anomalies when they occur.

DEQ does not approve QAPPs, but reviews them to determine if the minimum EPA guideline requirements are met and that the reuse permit requirements are satisfied. The reason DEQ does not approve QAPPs is that the responsibility for validation of the facility sampling data lies with the permittee's quality assurance officer and not with DEQ.

The format of the QAPP should adhere to the recommendations and references in 1) the Assurance and Data Processing sections of the DEQ Guidance and 2) EPA QAPP guidance documents. EPA QAPP guidance documents are available at the following website: *http://www.epa.gov/quality/qapps.html*

Idahoan Foods submitted a draft QAPP to DEQ via email on June 23, 2014 as part of the permit renewal application package. The draft QAPP should be revised after permit issuance to incorporate the monitoring changes presented in the new permit, and to add a section addressing instrumentation calibration (flow meters, pH probes, etc.).

8 Site Operation and Maintenance

The 202.3-acre reuse site is owned, operated, and maintained by Idahoan Foods personnel. Mr. Dan Huff serves as the plant manager, Mr. Leo Herbert serves as Idahoan Foods' corporate

environmental manager, and Mr. Tony Christiansen serves as the company's Farm Manager who manages the day to day operations of the reuse facility. Although not required for this industrial reuse permit, Mr. Christiansen has obtained his Class I WW treatment operators certification and the wastewater treatment land application certification. Mr. Christiansen has a number of employees who assist him with the operation and maintenance of the reuse system.

9 Compliance Activities

9.1 Status of Compliance Activities in Current Permit

The current permit LA-000010-05 had one Compliance Activity, CA-010-01, requiring an updated Plan of Operation. The updated Plan of Operation was to include a Quality Assurance Project Plan (QAPP) and a variety of management and operating plans (or sub-sections) including runoff management, odor management, buffer zones, well location acceptability analysis (WLAA), waste solids management, grazing management, crop management (crop rotations, harvest, irrigation rates, fertilizer requirements), and storage pond operation procedures.

The latest Plan of Operation (PO) revision was submitted by Idahoan Foods in August 2012. The management plans are included within the PO. DEQ reviewed and provided comments on the PO in a letter dated March 27, 2014. DEQ's comment letter stated the following:

> *Idahoan's reuse permit expires in approximately eight months, and due to rule changes and clarified standard permit conditions in all new permits, Idahoan's Plan of Operation and QAPP will need to be substantially revised – or completely re-written – upon issuance of Idahoan's next reuse permit to add the items missing above and incorporate any changes in the new permit. Therefore, even though the current PO is missing details required by the current permit, DEQ will consider the current PO 'approved' for the term of the current permit and will not require revisions at this time. Two compliance activities will be added to the next permit requiring 1) a revised Plan of Operation that meets the requirements of the latest Recycled Water Rules and reuse program requirements, and 2) a Quality Assurance Project Plan that contains the specific elements and details recommend(ed) in Section 7.1.6 and 7.1.7 of DEQ's reuse guidance manual."*

Staff recommend that a revised Plan of Operation and Quality Assurance Management Plan be required as separate compliance activities within the new permit.

9.2 Compliance Activities Required in New Permit

The following Compliance Activities are specified in the draft permit:

1. Submit an updated Plan of Operation that incorporates the requirements of the new permit, and addresses the comments in DEQ's March 27, 2014 review letter.
2. Submit a revised and final Quality Assurance Project Plan, including verification that the plan has been implemented by the facility, within 60-days of permit issuance.
3. Submit lagoon seepage rate test plans and reports in 2016, as specified in permit.

10 Recommendations

Staff recommends the draft water reuse permit be issued. The permit specifies hydraulic and constituent loading limits and establishes monitoring and reporting requirements to evaluate system performance, environmental impacts, and permit compliance.

11 References

Idahoan, 2014a. Recycled Water Reuse Permit Application forms, Trim #2014agh1676, November 12, 2014.

Idahoan, 2014b. Draft Quality Assurance Project Plan Revision Number:1, Trim #2014agh1305, June 30, 2014.

Idahoan, 2014c. Permit Renewal Application Letter, Trim #2014agh721, April 21, 2014.

DEQ, 2014a. 2014 Annual Site Performance Report Review, LA-000010-05, Trim #2015agh640, April 17, 2014.

DEQ, 2014b. 2013 Annual Site Performance Report Review, LA-000010-05, Trim #2014agh603, March 27, 2014.

DEQ, 2014c. 2012 Annual Site Performance Report Review, LA-000010-05, Trim #2014agh602, March 27, 2014.

DEQ, 2014d. 2011 Annual Site Performance Report Review, LA-000010-05, Trim #2014agh601, March 27, 2014.

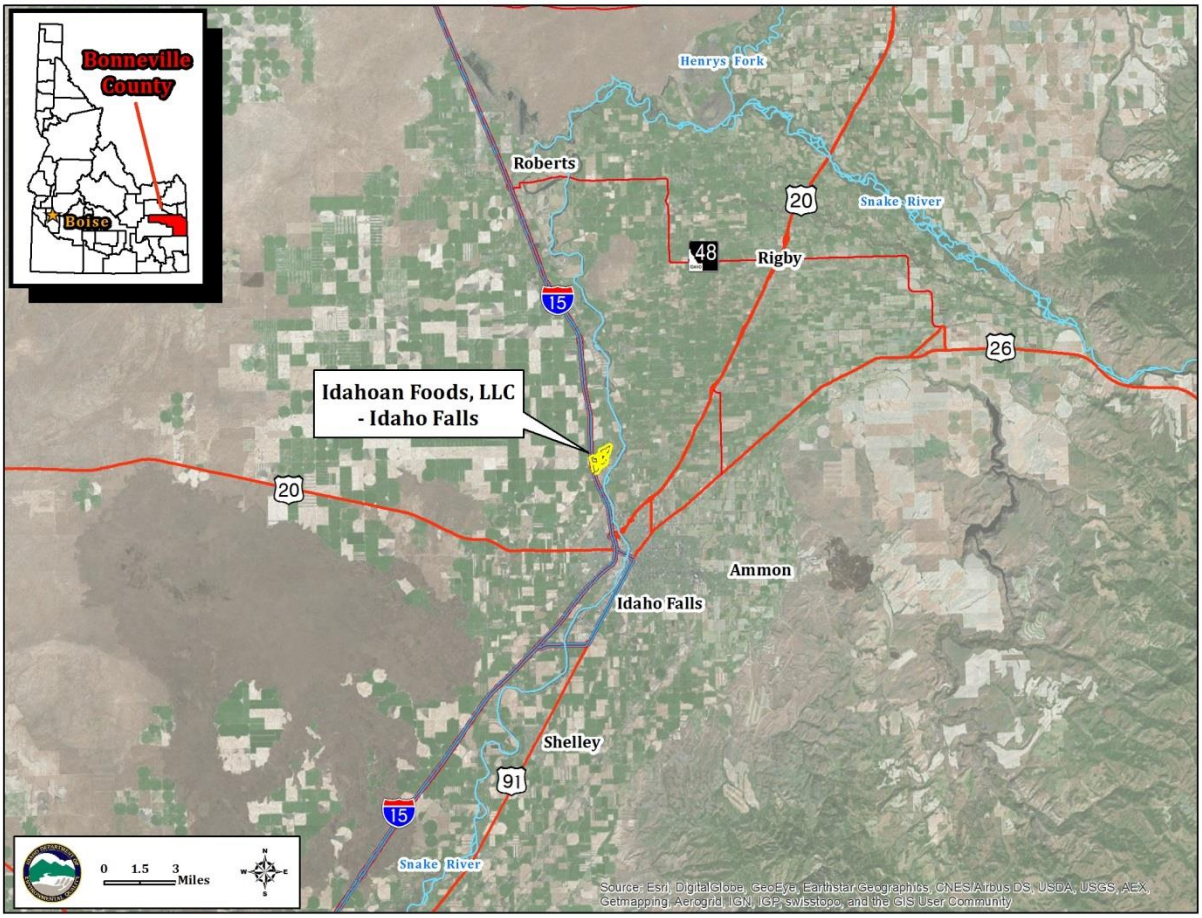
DEQ, 2013. 2013 Wastewater Reuse Inspection, LA-000010-05, Trim #2013agh1619, November 14, 2013.

DEQ, 2009. Industrial Wastewater Reuse Permit LA-000010-05, Trim #2010agh1496. November 20, 2009.

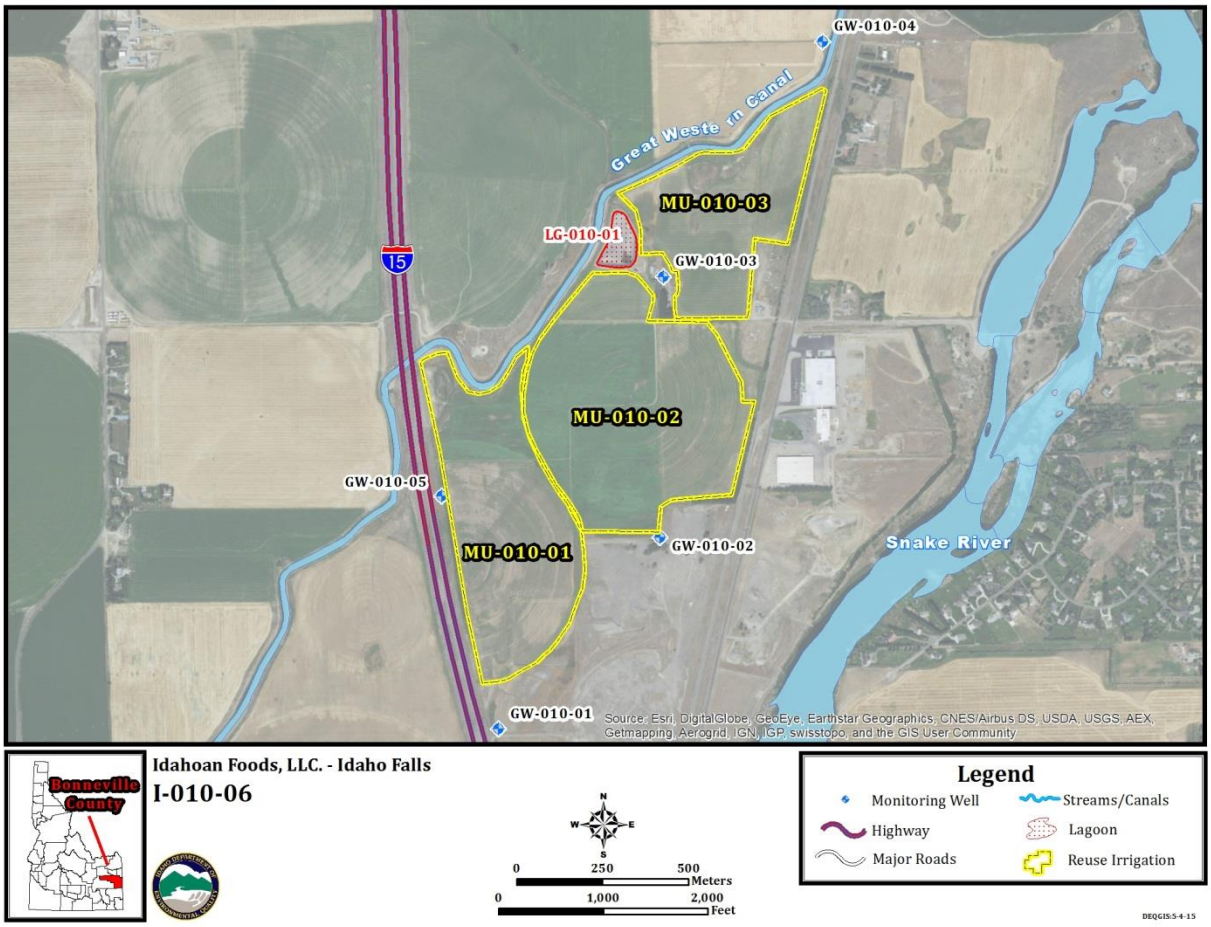
DEQ, 2013. 2013 Wastewater Reuse Inspection, LA-000010-05, Trim #2013agh1619. November 14, 2013.

Appendix A. Site Maps

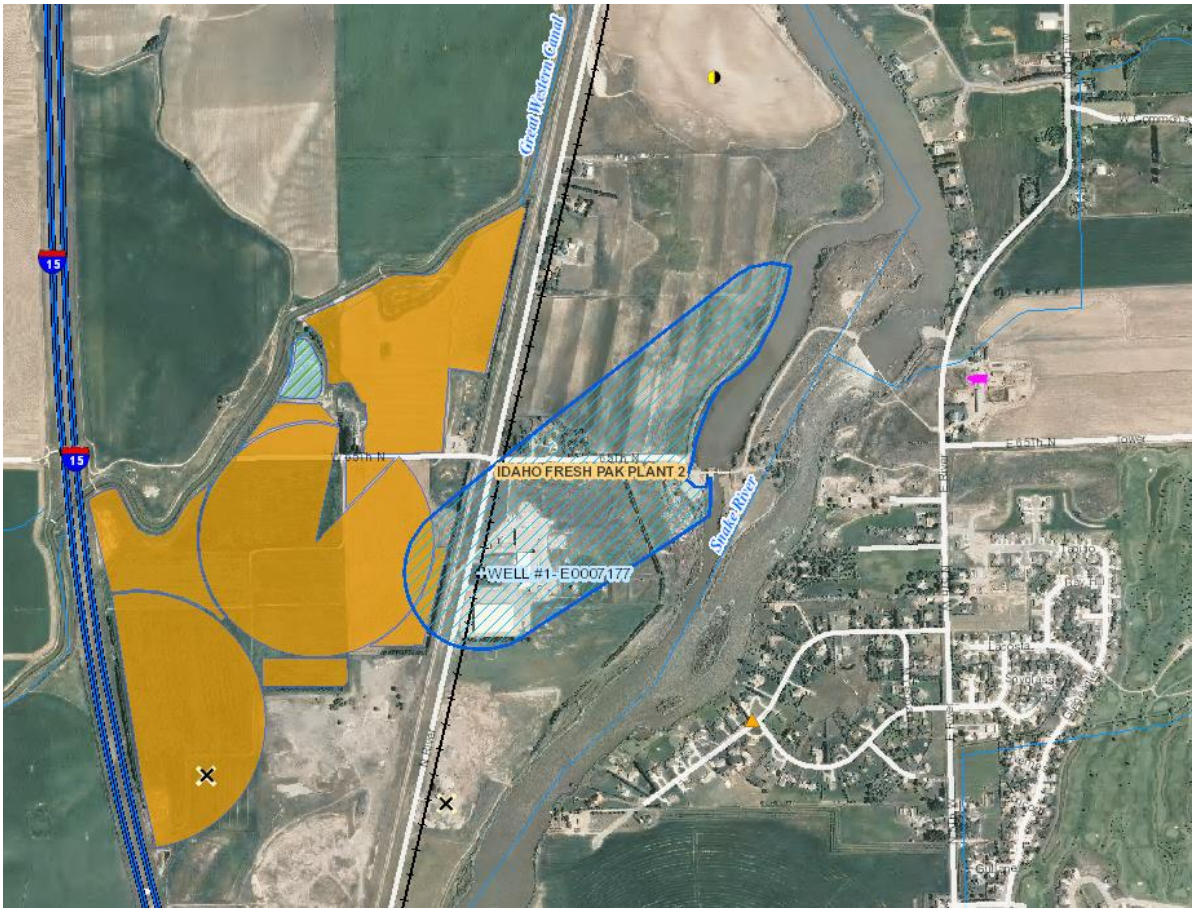
Regional Map

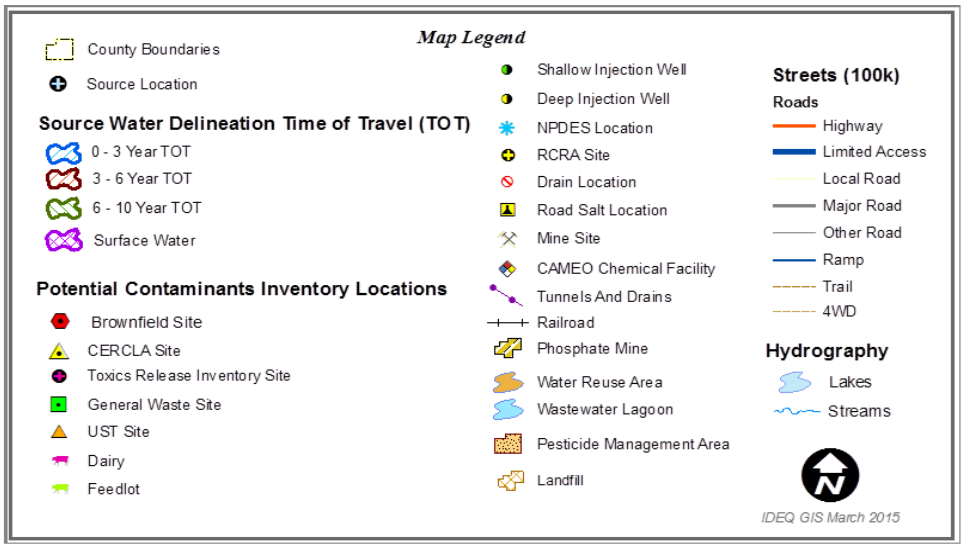


Facility Map

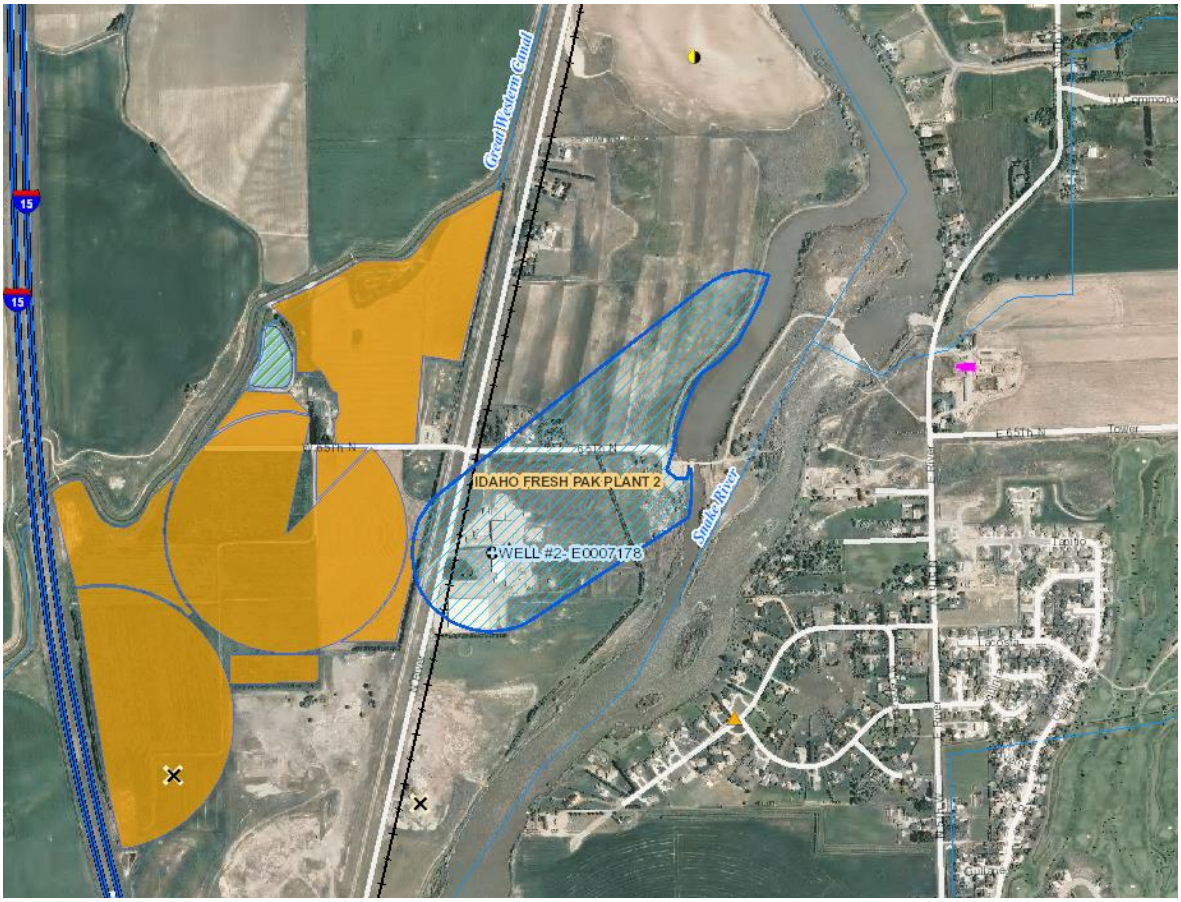


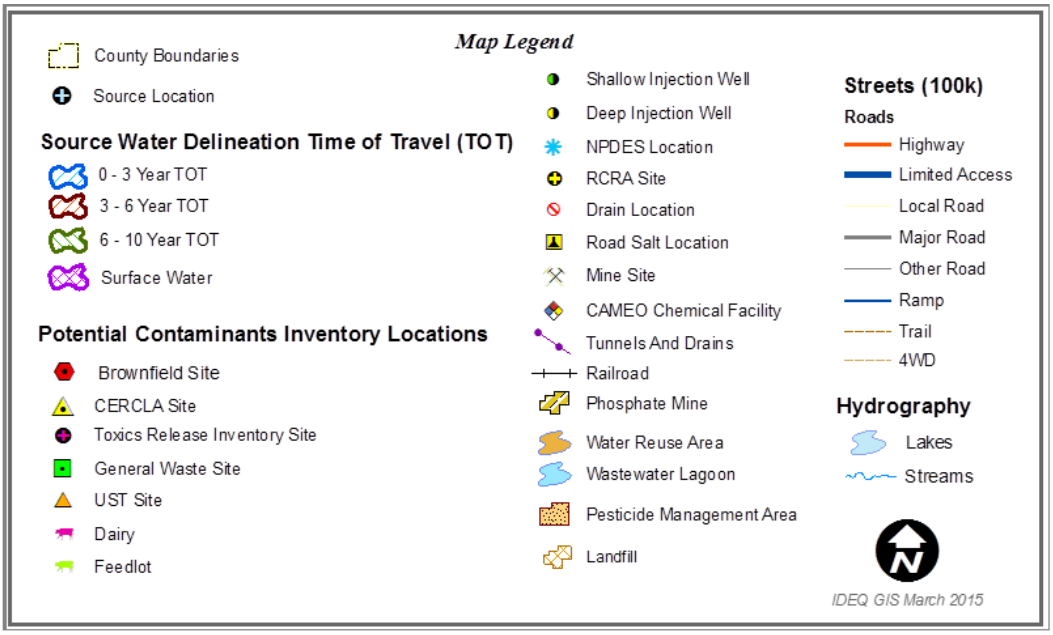
Idahoan Foods Main Public Water Supply Well and Estimated Capture Zone (Source: Source Water Assessment Summary Report: Idahoan Foods Idaho Falls Plant, PWS # ID7100083. DEQ, 2001)



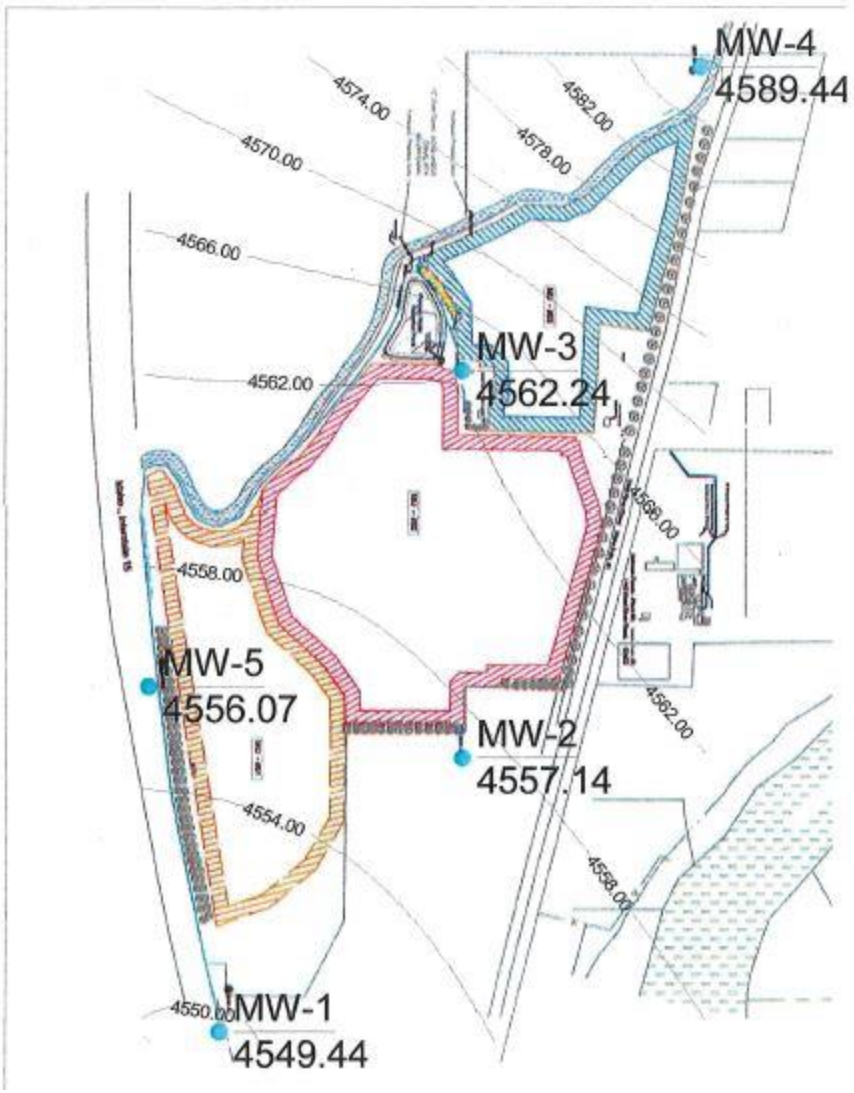


Idahoan Foods Backup Public Water Supply Well #2 and Estimated Capture Zone.
(Source: Source Water Assessment Summary Report: Idahoan Foods Idaho Falls Plant, PWS #ID7100083. DEQ, 2001).

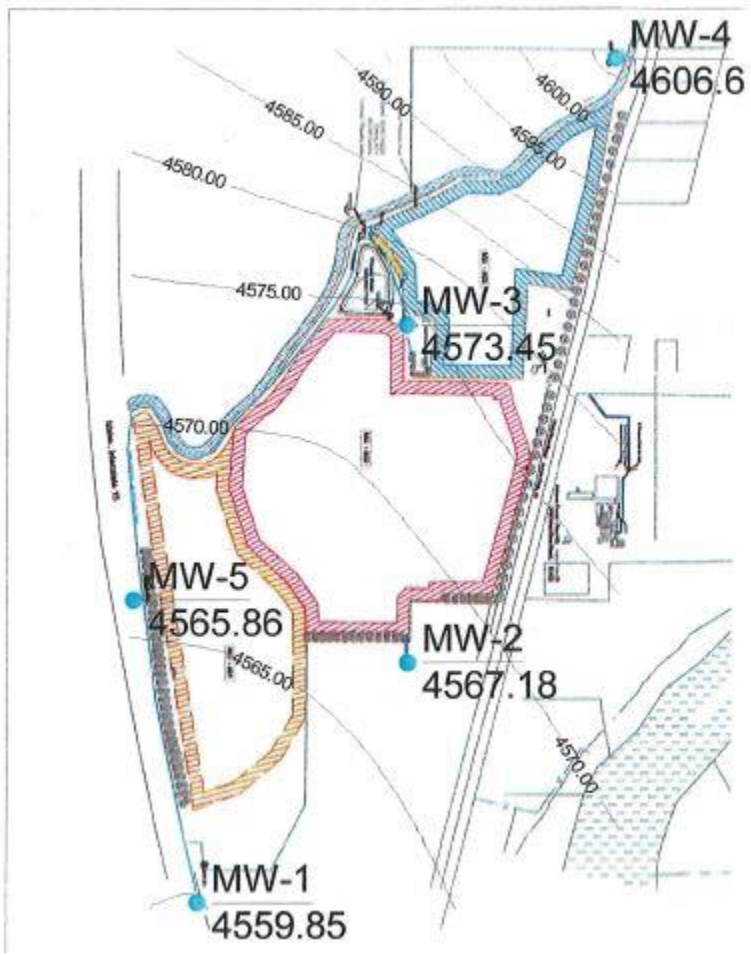




May 2014 Ground Water Contours:



July 2014 Ground Water Contours:



October 2014 Ground Water Contours: